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Management of Anadromous Fish Habitat on Public Lands

INCLUDING SUSTAINABLE MANAGEMENT CONCEPTS, AND STATUS AND TRENDS IN ALASKA, COASTAL AND COLUMBIA REGIONS

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1996

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

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INCLUDING SUSTAINABLE MANAGEMENT CONCEPTS, AND STATUS AND TRENDS IN ALASKA, COASTAL AND COLUMBIA REGIONS

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U.S. Department of the Interior, Bureau of Land Management, Anadromous Salmonid Team
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EDITED BY

Robert House, Anadromous Fish Coordinator, Boise, Idaho, May, 1996

ERRATA

PAGE 9, TABLE 1

Figure Error: Alaska anadromous stream mileage should be 15,145 and total BLM anadromous stream mileage should be 17,281.

PAGE 74, COLUMN 1

First sentence omitted. Paragraph should read: . . . standards, integrated with ARIMS, will be part of the aquatic resources data base and used in a geographic information system environment.

PAGE 74, COLUMN 3

Subhead omitted: "RESTORATION" should precede column copy.

PAGE 75, COLUMNS 1 AND 2

Bullet statements should read:

- establish an interdisciplinary team approach to managing resource problems,
- refocusing existing resources toward the issue,
- sharing funds and budgets between programs concerned with aquatic resource impacts and management, and
- leveraging resources with partners of common interests and responsibilities.

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MAY 1996

Director's Preface

The year 1996 marks the 50th Anniversary of the Bureau of Land Management and the 20th Anniversary of the Federal Land Policy and Management Act. That act gave our organization the mandate to sustain the health, diversity, and productivity of the public lands for the use and enjoyment of present and future generations. In 1994, we reaffirmed our commitment to that mission with the development of a *Blueprint for the Future*, an integrated, interdisciplinary vision for the future of the public lands and the future of the BLM.

It has been said that the key to long-term survival of an organization is the same as it is for species: flexibility and adaptability. As it responds to today's changing and diverse demands, the BLM is taking a "big picture," or landscape, approach to land management. This means focusing on watersheds to promote biological diversity and sustainable development on the public lands.

This approach is particularly fitting in the management of anadromous fish habitat. The Pacific Northwest, including Alaska and British Columbia, remains the most prolific salmon-producing region in the world, contributing millions of dollars to local communities each year. Yet we are seeing dramatic declines in salmon, steelhead, and sea-run cutthroat trout stocks, of which four populations already have been listed under the Endangered Species Act.

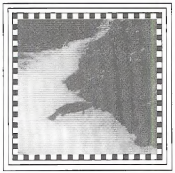
Lands administered by the BLM are crucial in conserving habitat for stocks at risk. In northern California, Oregon, Idaho and Washington, the BLM manages 2,136 miles of streams in 95 watersheds used by salmon, steelhead and sea-run cutthroat. In Alaska, the BLM manages another 15,145 miles of streams with anadromous salmonids in 53 Habitat Management Units.

Healthier watersheds throughout these regions will help prevent further declines in stocks that would lead to additional listings of anadromous fish populations as threatened or endangered. The "big picture" approach will also provide many other benefits, such as healthier plant and animal species, cleaner and more consistent water supplies, and a brighter future for the Pacific Northwest.

On their miraculous journey from fresh water to ocean and back again, salmon, steelhead, and sea-run cutthroat trout unknowingly migrate through a variety of jurisdictional boundaries. To succeed in the ambitious objectives outlined in this report, we, too, must see beyond such boundaries. That requires us to work in concert with other federal agencies, state and local governments, and the private sector to ensure the survival of these wild and wondrous species.

Mike Dombeck

Mike Dombeck
Acting Director, Bureau of Land Management



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Executive Summary

A watershed approach to management of anadromous salmonids and their habitats is essential on Bureau of Land Management (BLM)-administered lands in Alaska, California, Idaho, Oregon and Washington. This document summarizes the condition and health of riparian and aquatic components of the watersheds containing anadromous fish habitat for each state. Also, proposed management implementation actions are outlined, including riparian reserves, watershed analyses, identification of key watersheds for protection and restoration, proposed watershed restoration activities, and land tenure adjustments. Finally, an estimate of annual staffing and funding needs by state is provided in the appendix.

Present and future management of BLM land in Alaska, Idaho, Oregon, Washington and northern California needs to be designed to conserve and restore remaining wild stocks of anadromous salmonids. Conservation of anadromous salmonids can be accomplished by maintaining and restoring the quantity, quality, diversity and complexity of aquatic habitats. All activities and management concepts in this report are consistent with direction described in Forest Ecosystem Management Assessment Team (FEMAT) and Interim Strategies for Managing Anadromous Fish-producing Watersheds in Eastern Oregon and Washington, Idaho, and portions of California (PACFISH). In addition, they provide a management process to determine ecosystem health and watershed condition. In watersheds of Alaska, Idaho, Oregon, Washington and northern California, BLM administers the following miles of stream:

MILES OF STREAM	
Anadromous streams	17,281
Perennial fish and non-fish bearing streams	109,040

A successful management program for anadromous fish includes six critical components: establishment of riparian reserves/riparian habitat conservation areas (RHCAs) with associated riparian management goals, objectives and standards and guidelines; development of watershed analyses; delineation of key watersheds; watershed restoration; and monitoring.

Widths and standards and guidelines for riparian management areas have been established under the Final Supplement Environmental Impact Statement (FSEIS) for

the President's Forest Conference report (FEMAT 1993) and in the Decision Record for the interim PACFISH Environmental Assessment (EA). Presently, in lieu of site-specific or watershed analysis, these interim average widths range from a minimum of 300 feet (one side of stream) or the width of the 100-year floodplain (in rangeland streams) along fish-bearing streams to a minimum of 50 feet along intermittent streams outside key watersheds. Riparian management area widths have not been determined or established in Alaska.

Watershed analysis will contribute to development of an ecosystem-based management approach and should be completed for basins or subbasins containing significant amounts of BLM land and anadromous salmonids. Watershed analysis will enable managers to tailor management direction to accommodate site capabilities, limits and catastrophic events.

Along with watershed plans, 3,500 miles of stream and more than 280,000 acres of riparian habitat needs to be inventoried in California, Idaho, Oregon and Washington. Alaska needs broad and detailed inventories on anadromous fish streams in all key watersheds. Also, 115 key watersheds on BLM-administered lands with intact habitat, high fishery values, need of restoration and severe habitat or water quality problems, have been identified for protection and/or restoration for coastal, interior and Alaska regions.

Watershed restoration, divided into short-term in-channel work and long-term riparian, watershed and road improvement, includes treatment of 1,500 miles of stream and more than 86,000 acres of riparian habitat, better fish passage at 150 road culverts, small dams and waterfalls, and upgrading 9,000 miles of road, for watersheds outside of Alaska. To block up ownership, 485 miles of stream and more than 200,000 acres of riparian habitat and associated uplands have been identified for potential changes in land tenure.

Full implementation of efforts described herein would dramatically improve habitat conditions and anadromous fish production in some watersheds, especially in the Upper Salmon (Snake River), Nestucca, Alsea, Siuslaw, Umpqua, Rogue, Coquille, Smith (Umpqua River), Upper John Day and Mattole River basins where BLM manages substantial available habitat. This would contribute substantially to a sustainable and healthy supply of anadromous fish for this and subsequent generations to enjoy.

Introduction

Listing of three Snake River salmon stocks for protection under the Endangered Species Act (ESA) and identification of 214 other imperiled Pacific Northwest salmonid stocks (Nelhsen et al. 1991), many of which might be proposed for listing, have prompted the United States Forest Service (USFS) and BLM to revise their management of watersheds utilized by anadromous salmonids in the Pacific Northwest. This report, *Management of Anadromous Fish Habitat on Public Lands (MAFH)* emphasizes these watershed or ecosystem-based management approaches and contains the implementation elements of the Final Supplemental EIS to the westside forests (FEMAT 1993) and for the eastside, the PACFISH strategy for the Upper Columbia River and California (USDA Forest Service and USDI BLM 1995). Under the *Fish and Wildlife 2000 Plan*, BLM's strategy for management of anadromous fish was outlined in the *Anadromous Fish Habitat Management Plan*, completed in 1988. At that time, and based on the best available information, the plan described existing anadromous fish resources managed by BLM; summarized then-current management; and outlined a multi-year program to maintain, protect and enhance anadromous fish habitats through implementation of habitat improvement projects. However, since 1988 new information and strategies, as well as the magnitude and scope of anadromous fish declines have caused BLM to update and revise its direction for managing anadromous fish habitat.

The migratory nature of Pacific anadromous salmonids makes it difficult to manage along jurisdictional, state or district borders. Anadromous salmonids recognize no boundaries on their migration from the ocean to spawn in their natal streams. Management strategies that are effective in one watershed or basin are not necessarily successful in another. For instance, limiting factors on salmon and steelhead production in the upper Snake River are often different than those impacting coastal anadromous salmonids. For these reasons, BLM needs to organize management of anadromous fish by three regional-specific initiatives. These regional initiatives identify needs and opportunities to maintain and rehabilitate aquatic habitat and watersheds and increase fish production on public lands for 1) Columbia and Snake River stocks in Idaho, Oregon and Washington; 2) coastal stocks in California (including the Sacramento River), Oregon and Washington; and 3) Alaska stocks.

Protection of riparian and watershed values, coordination with other resource and regulatory programs and agencies, and full integration of USFS and BLM activities are all integral parts of successful ecosystem management. BLM is committed to developing and implementing ecosystem/watershed planning and management on public land throughout the range of anadromy in the Pacific Northwest and Alaska. The Federal Land Policy and Management Act (FLPMA) of 1976 and numerous other laws, regulations, policies, program guidance, Executive Orders, and memorandums of understandings (MOUs) direct BLM to manage lands in a manner that will provide quality habitat for fish and wildlife and protect the quality of water resources *(See Appendix 1)*. A watershed approach to management can be integrated with the USFS's and BLM's PACFISH strategy, as well as the U.S. Fish and Wildlife Service (USFWS), National Marine Fishery Service (NMFS), and respective state strategies (i.e. Oregon's Watershed Health Benchmark for the South Coast Basin). Also, managing on a watershed basis addresses the concerns and protection measures outlined in Option 9 (FEMAT 1993) for managing salmonids within the range of the northern spotted owl. An integrated watershed management approach should contain the same priorities and direction, criteria and prescriptions, and inventory and monitoring requirements developed for PACFISH and FEMAT. These new strategies provide for land management that sustains the long-term productivity of anadromous fish habitat on public lands.

The *MAFH* document does not replace the 1988 strategy. This report provides more detailed information on past and current conditions and provides critical components for management of anadromous fish on public lands. This document integrates new and more detailed information about existing habitat amounts and conditions, identifies watersheds and stocks in decline, summarizes past management actions to improve habitat conditions (through 1994), identifies key watersheds, identifies numbers or watersheds needing analysis/plans, identifies watershed restoration opportunities and provides an annual cost estimate for implementation.

Status and Trends

Anadromous salmonids of the Pacific Northwest are widespread, diverse and economically important. For example, in Oregon during a time of reduced catches, the commercial and recreational fishing industries for salmon and trout still contributed more than $50 million annually to its economy (Radtke and the Research Group 1992). In Alaska, Kretsinger et al. (1994) estimated the annual commercial value of summer chum salmon produced in the combined watersheds of Clear, Caribou and Bear creeks in the Hogatza River Area of Critical Environmental Concern (ACEC), which contain 97,000 acres, was $380,000. Salmon remain a critical component of subsistence fisheries and the cultural heritage of Native Americans. However, many salmonid stocks are at historically low levels in the Pacific Northwest (Nehlsen et al. 1991) and coho salmon and steelhead stocks are declining in British Columbia and Alaska (Nehlsen 1996).

The increasing concern for the survival of wild salmonid runs in the Pacific Northwest was highlighted by Nehlsen et al. (1991). Nehlsen concluded 106 anadromous salmonid populations, each possessing unique genetic characteristics, are already extinct in the Pacific Northwest. The study revealed 139 coastal anadromous salmonid stocks in 79 watersheds were at risk of extinction or of special concern. Seventy-four of these coastal watersheds contain coho salmon and have habitat problems. A closer look by Higgins et al. (1992), Nickelson et al.

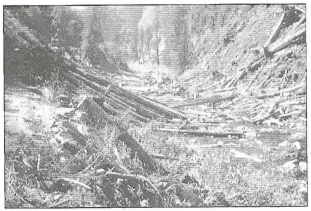
(1992) and Washington Department of Fisheries et al. (1993) further refined those stocks listed by Nehlsen and determined that as many as 512 anadromous salmonid stocks are found within the range of the northern spotted owl (FEMAT 1993). Of the 512 stocks listed in the FEMAT report, 314 are considered at risk, 73 of special concern, 105 of unknown status, and only 20 healthy. Shortly after the Nehlsen et al. report was published, the Pacific Fishery Management Council in 1991 formed a review team to assess the status of the Oregon coastal natural coho (OCN) stock after five years of failing to meet the annual spawning escapement objective. Echoing the continued concern, former Oregon Governor Barbara Roberts convened the Coastal Salmon Restoration Initiative Conference in December 1992 to develop cooperative strategies for protection and restoration of coastal ecosystems and offset the need to list salmonids under the Endangered Species Act. Presently, all anadromous stocks of coho salmon and steelhead in Oregon, California and Washington have been petitioned and are under review for potential listing under the Endangered Species Act. Stream and estuarine habitat is consistently identified as the most significant limiting factor for the production of coastal salmonids outside of Alaska and Canada. Integrated watershed management is the key to habitat protection and restoration.

As Lawson (1992) pointed out, the long-term steady decline in habitat quality, coupled with fluctuating patterns of ocean productivity, may eventually lead to extinction of many coastal anadromous stocks. One reason populations are currently low off Oregon and Washington is the present cycle of poor ocean productivity. Increases in fish numbers, as seen in Alaska with favorable ocean conditions, can be expected off Oregon and Washington with the next shift in productive ocean currents. However, increases in fish numbers will be short-lived if habitat is not improved. Lawson found that continued survival of wild coastal salmonid stocks in the Pacific Northwest depends on reversing the degradation of freshwater habitat quality. If degradation of stream and estuarine systems is not reversed, the next downward shift in ocean productivity may create an extinction vortex for many coastal and Columbia Basin stocks. The best strategy for reversing the downward trend in habitat quality is a combination of short-term and long-term coordinated management commitments and actions, designed to provide better habitat now and in the future.

Habitat Factors Influencing Salmonid Abundance

The original productivity of watersheds, estuaries, rivers, and tributary streams containing and influencing anadromous salmonids was substantially reduced due to human activities and land use beginning about 1870 (Lichatowich 1989). Historically, freshwater anadromous fish production was influenced by habitat conditions located in upland forests and range systems downstream to lowland estuaries.

In coastal and inland forested systems, timber harvesting and associated road building have had the single greatest impact on watersheds (Nehlsen et al. 1991; FEMAT 1993). Activities associated with timber harvest and road building include removing old-



Poor road construction and logging practices have dramatically impacted many streams and watersheds. Even where the best management practices now occur, a legacy of damage from past activities may continue for decades.

growth and mature coniferous trees in riparian zones, splash damming, stream cleaning, destabilizing fragile upslope areas, and increasing sediment delivery and water yields. The forest adjacent to streams provided a continual supply of trunks, stems, rootwads, and large limbs to the channel. Such large woody debris (LWD), derived from mature and old-growth coniferous and deciduous forests, influenced the physical and biological characteristics of streams, rivers and estuaries used by anadromous salmonids. LWD provides structure that maintains habitat diversity, controls channel morphology, stability and hydrology, decreases water velocity, creates pools, traps spawning gravel, provides instream cover, and creates off-channel overwintering habitat (Maser and Sedell 1994). Generally speaking, the larger the woody debris, the better and more diverse are habitats created for salmonids (Naiman et al. 1992). However, by 1980 most of the mature cedars, Douglas-firs, spruces, pines, hemlocks and deciduous trees in riparian zones in the Pacific Northwest had been removed. In many cases, the riparian zones along forested streams with anadromous fish are now dominated by young stands of dense red alder or second-growth conifers, which do not have the inherent capability of adding LWD now or in the near future. Also, millions of trees have been cleared from Pacific Northwest estuaries, rivers and streams, completely changing their pristine conditions (Sedell et al. 1988). **Also, it now appears that the rate of recovery of all disturbed habitat and watersheds is a much slower process than originally estimated (Bilby and Ward 1991).** For example, hundreds of years would elapse before streams cleaned of LWD and lacking adjacent old-growth riparian overstory would receive sufficient amounts of large wood to develop characteristics favorable for good anadromous fish production.

In coastal lowlands, agriculture and municipal/industrial development have also had a great impact on anadromous fish production. These activities include altering riparian habitat, water diversion, snagging trees, ditching, road building, gravel mining, diking, dredging, and filling of rivers and estuaries. Historical impacts have been so severe in downstream forested river reaches, that proportionally more fish production is now occurring in the upstream forested reaches of watersheds.

In non-forested/rangeland stream systems, a varied combination of activities (grazing, gold and gravel mining, fire wood cutting, flood control, water diversion for irrigation, municipal development, transportation, etc.) within watersheds has changed and decreased the amount and quality of stream and riparian habitat and destabilized uplands. The end result has reduced access of rivers to floodplains, reduced base productivity, changed stream flow patterns, changed the amounts and duration of sediment delivery, simplified and destabilized stream channels, reduced woody stream structure and reduced water quality. Where mature willows, cottonwoods, aspens, sedges and native brunch grasses once dominated rangeland riparian zones, many of these zones currently consist of sagebrush and non-native grasses. The capability of most inland watersheds to produce anadromous salmonids has been significantly altered and decreased.

Hydroelectric dams, especially in the Columbia, Snake, and Sacramento River Basins, have been a major cause in the downward trends of anadromous salmonids. Dams have increased fish mortality mainly due to losses from power turbines, timing and migration of

As late as the early 1970s removal of old-growth conifers and stream cleaning was occurring in many small headwater coastal Oregon streams, many of which supported coho salmon, steelhead and sea-run cutthroat trout.

downstream smolts and increased river predation from native and non-native fish species (i.e. squawfish and walleye). Presently, at least 67 anadromous stocks have become extinct in the Columbia Basin, mainly due to blocking access and operations of mainstem and tributary dams.

Another condition affecting salmonid survival is the shoreline/coastline ratio. Coastal areas of Oregon, Washington and northern California have a low shoreline/coastline ratio compared to British Columbia and Alaska (Bottom et al. 1986). Well-developed estuaries and other nearshore rearing areas are critical for early salmonid survival in the ocean (Pearcy 1992). During unfavorable ocean conditions, nearshore rearing areas are extremely important. Their limited distribution outside of Alaska makes the presence of large amounts of high-quality freshwater habitat critical for survival of salmonids.

Other Factors Influencing Salmonid Abundance

In some watersheds large numbers of hatchery salmonids return to spawn naturally and interbreed with their wild counterparts. Long-term consequences of hatchery fish interbreeding with wild salmonid populations have negative influences by either reducing fitness or decreasing genetic diversity. Chilcote et al. (1986), for example, found reproductive success of hatchery-reared steelhead was substantially less than that of wild steelhead. Furthermore, Hilborn (1992) has demonstrated that most anadromous salmonid hatcheries are unsustainable in the long-term.

Ocean conditions also have a significant affect on the abundance of adult salmonids from year to year (Nickelson 1986). The combination of ocean warming (caused from the climatic phenomenon known as "El Niño") and weak upwelling off northern California, Oregon and Washington resulted in poor ocean survival of coho salmon since the mid-1970s. These same conditions have had positive effects on salmonid survival off Alaska. Also, recent increases in marine mammals may also affect salmonid populations, especially during times when fish runs are low. Of course, any loss of individual adults can be critical when populations are low.

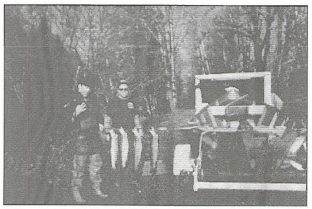
From Alaska to California, harvest from commercial, recreational and subsistence fisheries probably has severely reduced populations of anadromous salmonids in some watersheds. Salmon are commercially harvested in the

ocean, while Native American, subsistence and recreational fishers harvest salmon and trout from the ocean, estuaries, and rivers. Yearly sport and commercial harvest of salmon in the ocean is subject to previously mentioned variable ocean conditions, both on a short and long-term basis. In addition, the mixed stock fishery in the Pacific Ocean exacts an unproportionally high mortality on wild stocks. In general, most wild chinook salmon, coho salmon, steelhead and sea-run cutthroat runs are declining in coastal and Columbia tributaries and their status is unknown in Alaska.

Status of Anadromous Fish and Habitat on BLM Lands

Seven species of anadromous salmon and trout (chinook, coho, chum, sockeye, and pink salmon, steelhead, and sea-run cutthroat trout), members of the whitefish family (least and Arctic ciscos, broad and humpback whitefish and sheefish), and Dolly Vardon, shad, smelt, striped bass, sturgeon, and lampreys spend some or most of their freshwater life in rivers, streams and lakes managed by BLM. These waters are located from central California north to the North Slope of Alaska and east from the Pacific Ocean to eastern Idaho (*refer to Figures 1-5, Appendix*).

BLM administers about 2,136 miles of streams in 95 basins that are currently used for spawning and/or rearing anadromous salmonids in coastal and Columbia River areas (*Table 1*). Of the 2,136 miles of stream used by anadromous salmonids, chinook salmon are found in about 905 miles, coho salmon in 820 miles, sockeye salmon in 175 miles, chum salmon in 2 miles, and steelhead in 2,136 miles. In these areas, BLM also manages another 810 miles of streams located below and above major dams with and without fish passage that currently do not have fish runs because they are either dewatered or fish have no access. Another estimated 12,620 miles of perennial streams, some containing resident trout, are upstream of anadromous-fish producing streams and directly affect their quality. In Alaska, BLM administers more than 15,145 miles of streams that are currently used for migration, spawning and/or rearing anadromous salmonids (*Table 1*). Of the 15,145 miles of stream used by anadromous salmonids, chum salmon are found in about 13,565 miles, chinook salmon in 12,169 miles, pink salmon in 10,122 miles, coho salmon in 7,176 miles, sockeye salmon in 469 miles, and steelhead in 117 miles. Alaska manages about 96,420 miles of perennial streams, many containing resident grayling and whitefish populations. Of the 95 major watersheds of California, Idaho, Oregon, and Washington containing anadromous salmonids, BLM manages streamside land in 88 watersheds containing 243 stocks of which 173 are at some risk of extinction (*Table 2*). Another eight watersheds contain Federally listed stocks. In Alaska, BLM manages land in 76 major watersheds containing a high but currently unknown number of anadromous stocks. In the Yukon River Basin alone, over 65 stocks of chum and 25 stocks chinook salmon have been identified (unpublished data, USFWS, Yukon River Salmon Treaty).



Salmon and steelhead produced in streams managed by BLM support an important recreational fishery.

Presently, 3,676 miles of stream supporting salmon and trout populations on BLM land in California, Idaho, Oregon and Washington, have habitat conditions that are evenly divided among minimal, fair and optimal. A more specific assessment of existing aquatic habitat condition on BLM land in Oregon and Washington is reflected in the number of high-quality pools. The number of high quality (equal to or greater than 2.5 ft deep and 225 ft^2 in size) pools/mile of stream is an indicator of stream, riparian and watershed condition for anadromous fish production. Based on historical records and surveys in pristine areas, the number of high-quality pools in medium to large size streams in the Pacific Northwest (outside of Alaska) varied by watershed and stream type, but generally ranged from 25 to 60 pools/mile (FEMAT 1993). Based on stream inventories completed in the late 1980s and early 1990s, most BLM tributary and mainstem streams in Oregon and Idaho had substantially less high-quality pools compared to historic or pristine levels. Most streams had pool numbers that were less than half the numbers found at the low end of the natural range. The following information is an analysis of pool numbers by watershed for some BLM streams:

STATE/WATERSHED	HIGH QUALITY POOLS/MILE
Oregon	
Nestucca	4
Alsea	10
Siuslaw	7
Smith	3
Coquille	13
Chetco	19
John Day	0
Idaho	
Lower Salmon	7
Lemhi	5

In Alaska, little is known about the condition of habitat and anadromous salmonid populations in specific watersheds, but generally habitat remains in a natural state and populations have not been impacted by human activity. Some habitats and fish populations have been impacted by mining, roads,

Table One

BLM STREAM MILES

STATE	ANADROMOUS STREAMS EXISTING	ANADROMOUS STREAMS HISTORICAL[a]	PERENNIAL STREAMS INFLUENCING
Alaska	17,377	-	96,420
California	220	10	1,250
Idaho	314	405	949
Oregon	1,576	540	9,860
Washington	26	60	130
TOTAL	19,513	1,015	108,609

a- Historical miles are streams that were once accessible to anadromous fish but presently have unnatural barriers (i.e. dams) to fish migration.

BLM stream miles with existing anadromous use, historically occupied and perennial streams influencing anadromous streams.

Table Two

STATE	BLM WATERSHEDS NUMBER	BLM WATERSHEDS W/STOCKS AT RISK	STOCKS AT RISK TOTAL	STOCKS AT RISK AT RISK	STOCKS AT RISK LISTED
Alaska[a]	76	UK	UK	UK	0
California	14	14	33	21	1
Idaho	13	12	6	3	3
Oregon	49	46	139	110	2
Washington	19	16	65	39	2
TOTAL	171	88	243	173	8

a- UK= Status and number unknown

Number of major watersheds by state with listed stocks or stocks "at risk" of extinction.

From Alaska to California, BLM streams provide salmon for commercial ocean harvest.

oil and gas development, recreation, commercial and subsistence fishing. Of the estimated 4,257 miles of BLM administered streams in Alaska, identified as salmonid production areas, about eight percent have been directly impacted due to mining activities (D. Tol, BLM, personal communication). Preliminary information from detailed inventories on pristine Seward Peninsula coastal streams and forested streams within the Yukon River Basin reveal different habitat conditions compared to relatively undisturbed streams in the Pacific Northwest (C. Kretsinger, BLM, personal communication).

Past BLM Management Efforts

Although current BLM efforts have increased substantially over the last three years, results in achieving the recommendations outlined in the 1988 strategy have met with varying success. These 1988 objectives included inventorying 3,480 miles of stream by 1994, improving 464 miles of stream and completing 15 cooperative habitat management agreements/plans. As of 1995, about 1,553 miles of stream have been inventoried (including inventories conducted prior to 1988 strategy), 271 miles of stream were treated since 1988 and 41 habitat (watershed) management plans were completed on high priority watersheds.

Since 1971, BLM has spent more than $4.5 million restoring about 266 miles and providing new access to another 339 miles of coastal streams used by anadromous salmonids (*Table 3*). Also, BLM has spent more than $700,000 restoring about 60 miles of stream in the Columbia Basin. In Alaska, restoration work has concentrated on stream impacts from placer mining. Currently, Nome Creek in the Fairbanks area is being restored. Long-term restoration of roads and improving riparian and upland vegetation recently has taken on greater emphasis. BLM replanted 900 acres of riparian areas and rehabilitated more than 250

Table Three

STATE	MILES TREATED	MILES ACCESSED	COSTS (000S)
Alaska	1	-	100
California	98	-	565
Idaho	10	-	200
Oregon	156	339	3,657
Washington	1	-	25
TOTAL	266	339	4,547

Summary of past rehabilitation projects.

miles of road and 240 acres of uplands to prevent erosion.

BLM completed detailed basin-wide inventories on about 1,553 miles of stream and broad-scale inventories on more than 1,000 miles of stream. Most monitoring has concentrated on documenting changes in fish numbers and stream habitat resulting from restoration projects. Essentially, no long-term monitoring has been conducted to determine changes in watershed conditions or habitat objectives.

BLM acquired at least 66 miles of anadromous streams since 1988 to facilitate better watershed management objectives (*Table 3a*).

Critical Components of Successful Management

In recent years, six critical components of improved management have emerged from regional strategies (FEMAT, PACFISH): development of quantified riparian management objectives (RMOs); conducting watershed-scale analysis/planning; designating expanded riparian management areas (RMA; also known as Riparian Reserves or Riparian Habitat Conservation Areas); monitoring/evaluation; designating key watersheds for restoration and increased protection; and watershed restoration. Implementation of watershed analyses on BLM land is a relatively new concept. There is a need to integrate existing management guidance and the best available science to identify and define key elements of successful anadromous fish and watershed management. The content of key planning components is interdisciplinary and consistent with ecosystem management efforts. Watershed planning and management is coordinated between natural resource professionals and extends across district, resource area and agency boundaries. Collectively, watershed plans become the building blocks for Resource Management Plans (RMP), ensuring that key BLM planning components remain dynamic and responsive management tools.

A comprehensive and standardized analysis of past, present and future land use and resource condition is an essential starting point for all land-use plans. A comprehensive watershed analysis, which includes cumulative effects assessments, will precede and guide formulation of management objectives, desired future conditions and management direction (Williams and Williams 1996). Watershed analyses will employ the perspectives and tools of multiple disciplines, including geomorphology, hydrology, geology, fish and terrestrial ecology and soil science (FEMAT 1993). There is an urgent need to conserve

Table Three (a)

STATE/R.A.	RIVER	MILES	SPECIES AFFECTED
California			
Arcata	Mattole	6	Coho salmon, steelhead
Redding	Trinity	10	Coho and chinook salmon, steelhead
Idaho			
Cottonwood	Salmon/Snake	3	Sockeye, chinook salmon, steelhead
Oregon			
Clackamas	Molalla	14	Chinook salmon, steelhead
Coast Range	Umpqua	3	Coho and chinook salmon, steelhead
Central Oregon	John Day	26	Chinook salmon, steelhead
Alsea	Alsea	1	Coho and chinook salmon, steelhead, sea-run cutthroat trout
Washington			
Wenatchee	Columbia tribs.	3	Steelhead

and restore stocks of Pacific salmon and anadromous trout and their habitats in the western United States. This can be accomplished by maintaining and restoring the quantity, quality, diversity and complexity of fish habitats needed to conserve and restore all remaining stocks of western anadromous salmonids in Alaska, Idaho, Oregon, Washington and California.

12 Conserving and restoring anadromous fish stocks can be accomplished by meeting these broad objectives (Naiman et al. 1992):

To maintain optimum fish production, its important that BLM protect the integrity of 17,281 miles of stream containing anadromous fish habitat and more than 109,000 miles of headwater streams that influence anadromous fish habitat, as well as associated riparian areas.

1 Maintain and restore the distribution, diversity and complexity of watershed and landscape-scale features to ensure protection of aquatic systems to which species, populations and communities are uniquely adapted.

2 Maintain and restore spatial and temporal connectivity within and among watersheds. Lateral, longitudinal and drainage network connections include floodplains, wetlands, upslope areas, headwater tributaries and intact refugia. These linages must provide chemically and physically unobstructed routes to areas critical for fulfilling life history requirements of aquatic and riparian-dependent species.

3 Maintain and restore the physical integrity of the aquatic system, including shorelines, banks and bottom configurations.

4 Maintain and restore water quality necessary to support healthy riparian, aquatic and wetland ecosystems. Water quality must remain in the range that maintains the biological, physical and chemical integrity of the ecosystem, benefitting survival, growth, reproduction and migration of individuals composing its aquatic and riparian communities.

5 Maintain and restore the sediment regime from which the aquatic system evolved. Elements of the sediment regime include the timing, volume, rate, and character of sediment input, storage and transport.

6 Maintain and restore instream flows sufficient to create and sustain riparian, aquatic and wetland habitats, and to retain patterns of sediment, nutrient and wood routing. The timing, magnitude, duration, and spatial distribution of peak, high, and low flows must be protected.

7 Maintain and restore the timing, variability and duration of floodplain inundation and water table elevation in meadows and wetlands.

8 Maintain and restore the species composition and structural diversity of plant communities in riparian zones and wetlands to provide adequate summer and winter thermal regulation, nutrient filtering, appropriate rates of surface erosion, bank erosion and channel migration and to supply amounts and distributions of large wood sufficient to sustain physical complexity and stability.

9 Maintain and restore habitat to support well-distributed populations of native plant, invertebrate and vertebrate riparian-dependent species.

Habitat Quality

The following description of healthy, properly functioning habitat for anadromous salmonids applies to moderately-sized watersheds ranging in size from 5 to 200 square miles. Although most, if not all, anadromous production on BLM lands comes from these moderately-sized stream systems, these streams are dependent in the long-term on conditions in smaller headwater streams. Not all of the minimum threshold conditions might occur in abundance in a specific reach of stream within a watershed, but all will occur in abundance in the total watershed. Productive natural habitats have the same general characteristics:

WATERSHED CONDITION. Upland portions of watersheds are well-vegetated, fairly stable, and free from chronic and accelerated sedimentation. Watersheds are free from disturbances that alter natural flow regimes and the quality of water emanating from uplands. Unstable headwall areas are generally vegetated.

RIPARIAN VEGETATION. Forested watersheds contain small and large conifers or a mixture of conifers and hardwoods in riparian zones and near-stream upland areas. Stream banks are vegetated with shrubs and other low-growing woody vegetation. Non-forested watersheds or portions of watersheds (generally rangeland and tundra systems) have an abundance of shrubs and hardwoods in the riparian zones coupled with luxuriant growths of grasses and forbs along streambanks. Also of importance are the many miles of stream, especially in Alaska, that contain only grasses and forbs and no woody vegetative component in riparian areas. Root systems in streambanks of the active channel allow development and maintenance of stable undercut banks.

CHANNEL CHARACTERISTICS. The most productive stream systems for mixed salmonid communities have relatively low gradient reaches (less than 5 percent) with a mix of constrained and unconstrained channel types containing a broad diversity and complexity of habitat features. Good habitats maintain a balance between high-quality pools, riffles, glides, and side channels, with a pool frequency of about one pool per four to seven channel widths (varies by channel width). Cover features such as large woody debris, boulders, undercut banks, overhanging vegetation, deep water and surface turbulence are abundant in all habitats. Substrates consist of a variety of particle sizes ranging from silts to boulders, to accommodate the spawning and rearing needs of the multi-species community. Spawning gravels contain low percentages of fine sediments. Channels are free of unnatural obstructions that interfere with the upstream or downstream migration of adult or juvenile salmonids.

WATER QUANTITY. The best salmonid habitats provide relatively stable streamflow, and are buffered from natural extreme droughts or floods. Adequate flow is critical at specific times in life cycles for spawning, rearing, and migration.

Fish are adapted to natural variations in flow regimes, but are adversely affected by disturbances that alter natural flow cycles. The natural amplitude and timing of annual flow events should be maintained, including flushing flows for channel maintenance and sediment transport.

WATER QUALITY. All salmonids require consistently excellent quality water for spawning, rearing and migration. An abundance of fairly cool, well-oxygenated water free of pollutants, is required at all seasons of the year. Suspended sediment should not exceed background levels in undisturbed watersheds and should remain in phase with freshets and flood events.

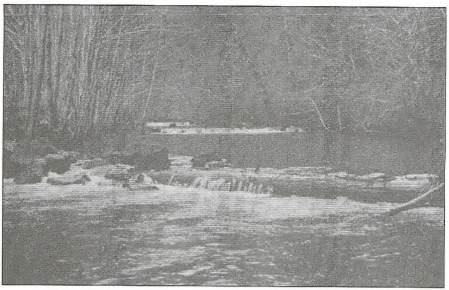
Riparian Management Objectives

RMOs establish stream and riparian conditions that define good anadromous fish habitat at the watershed scale, and serve as indicators against which attainment, or progress toward attainment, of goals can be measured. Anadromous fish would be produced naturally at dynamic levels reflecting changes in the productive capability of the aquatic and riparian habitats. PACFISH identified six features (quantifiable and subject to accurate and repeatable measurements) and interim objectives, to serve as indicators of ecosystem health: pools per mile; water temperature; amounts of LWD; streambank stability; width-to-depth ratio; and bank angle. These features do not address all important aspects of anadromous fish life history and biological requirements, nor all of the potential land use impacts. Other features, such as fine sediment and riparian vegetation, can also be used. The goal is to achieve a high level of habitat diversity and complexity, through a combination of habitat features. RMOs need to be time-specific to reflect the ecological capabilities of specific watersheds. Through watershed analysis, RMOs can be tailored to the geology, topography, climate, vegetation, channel characteristics, and habitat needs of specific salmonid assemblages in the watershed, and an assessment can be made of what habitat conditions are attainable in a given watershed.

Watershed Plans/Analysis

Traditionally, BLM's approach to habitat management has focused on portions of streams and rivers within the agency's jurisdiction. However, the ecosystem or watershed approach to management, which looks at aquatic communities and their supportive habitat, is the appropriate basis for managing BLM land now and in the future. This requires close coordination and cooperation among all landowners and managers within watersheds.

A watershed approach incorporates all features of aquatic ecosystems, including physical, chemical and biological components.



Since 1971, BLM has spent over $3.6 million on 205 miles of coastal stream to restore anadromous fish production.

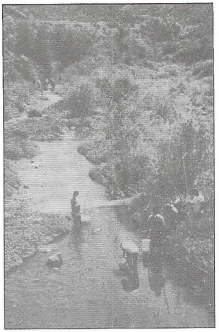
Watershed analysis is a scientific analysis of the most significant ecological and social forces affecting aquatic habitat conditions within a local watershed. Watershed analysis is a dynamic process, constantly changing with new information, ideas and synthesis. Watershed analysis tailors regional or state strategies to specific watersheds (such as by modifying RMA widths to local geomorphology). The six-step process outlined in the Federal Guide for Watershed Analysis "Ecosystem Analysis at the Watershed Scale" will be used (Regional Interagency Executive Committee 1995):

1. Characterization of the watershed.
2. Identification of issues and key questions.
3. Description of current conditions.
4. Description of reference conditions.
5. Synthesis and interpretation of information.
6. Recommendations.

The core topics for analysis are erosion processes, hydrology, vegetation, stream channel, water quality, species and habitats, and human uses. Watershed analysis should also include a discussion of appropriate scale and the importance of examining watershed scale information with stream reach and the larger land use planning area.

Inventory

Intensive basinwide habitat inventory information provides the foundation for land use, watershed analysis, activity planning, monitoring, and watershed restoration. Inventory data needs to be stratified by watershed, stream size, channel type, geographic area, hydrologic province and geologic province. Cumulative effects analyses based on inventory information provide the foundation for land use and watershed planning, restoration work, activity plans, monitoring and analysis. Inventories will enable BLM to identify past and present high production areas. These areas need sufficient protection so that they can maintain stocks, especially if the watershed has degraded areas and recovery time is required. Data are needed to evaluate existing conditions and impacts of management action alternatives and to develop site-and watershed-specific objectives and actions for watershed plans. Presently only 29 percent of the streams in the Pacific Northwest and about 0.005 percent of the streams used by anadromous salmonids in Alaska have been intensively inventoried for habitat quality, quantity and condition. *Table 4* is a summary of completed intensive inventories and additional inventory needs by state.



Inventorying habitat conditions and the response of fish to habitat changes is an important part of BLM's anadromous fish program.

Having the capability to manage tabular and spatial aquatic resource data is essential for watershed planning. BLM is currently developing in Alaska an Aquatic Resources Information Management System (ARIMS) that will be available for data entry in June 1996. ARIMS will be used on BLM lands within the range of anadromy to assist with ecosystem planning and management efforts. This system provides the capability to store, protect, retrieve, and analyze aquatic resource information on a local, interagency, bio-regional

Table Four

STATE	STREAM HABITAT (MILES) TOTAL	STREAM HABITAT (MILES) COMPLETED	RIPARIAN HABITAT (ACRES) TOTAL	RIPARIAN HABITAT (ACRES) COMPLETED
Alaska	21,140	87	-	-
California	220	31	18,100	2,340
Idaho	1,279	420	15,785	792
Oregon	3,374	1,014	269,223	19,326
Washington	114	1	869	303
TOTAL	26,127	1,553	303,977	22,761

Summary of riparian and stream inventories by state.

and landscape basis as needed. Consistency in data collection and data management needs to be developed for inventory and monitoring data. Standards need to be developed for acquisition and interpretation of remote and resource base data. Resource analysis and conflict resolution cannot occur on a landscape basis without baseline information and the systems to manage the data.

ARIMS contains data fields and entities pertaining to administration, watersheds, water bodies, project, flow and channel morphology, water quality, lake habitat, stream habitat, and fish population and escapement. Included in these entities are places for data generated from such varied activities as hazardous materials evaluation and monitoring, stream habitat inventory and monitoring, Wild and Scenic River inventory, stream flow monitoring, development of mitigation and restoration design for National Environmental Policy Act (NEPA) compliance and surface protection to name just a few.

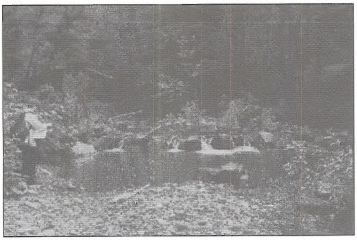
GEOGRAPHIC INFORMATION SYSTEM (GIS). Ecosystem and landscape management requires answers to questions at a scale that is greater than traditionally has been employed. The analytical tools necessary to address these questions are provided by modern science and technology. Tools made available by GIS and Remote Sensing are key to managing landscapes and complexes of ecosystems. Today, managers are required to consider the effects of their decisions and strategies not only at the site level, as in the past, but at the regional and larger level. Not only does the Bureau need to use GIS and remote sensing for general resource management applications, there is the underlying need to use this technology and science for better understanding and study of ecosystems.

A landscape and ecosystem approach to management of anadromous fisheries that uses watersheds as management units is needed. As such, the basic tools and principles for ecosystem and landscape management are equally applicable for FEMAT and PACFISH as well as all other ecological studies. Unfortunately, the Bureau has not been able to deploy these tools or consolidate the knowledge necessary to fully utilize them in field offices.

Monitoring/Evaluation

Monitoring is an integral component of land management that adds internal and external accountability into watershed management. Watershed plans will include a monitoring and evaluation component that documents and describes how well objectives are met. Monitoring will include implementation (how closely management direction is applied), effectiveness (how well have objectives been met), and validation (accuracy of the plan's underlying assumptions over time).

Monitoring will evaluate in-channel biological and physical conditions, water quality, riparian areas and watershed conditions. Monitoring should establish "threshold levels of concern," needed to trigger additional evaluation, project modification, delay and/or cancellation. Monitoring activities will take place at regular, well-spaced, long-term intervals. Each watershed plan will have an estimate of monitoring costs and provide for an annual report of monitoring results. There remains a critical need to allocate funding for monitoring and this need varies because watersheds will have different levels and intensities of effort.



Monitoring for habitat changes and, it is hoped, increases in fish numbers will tell BLM if and when management objectives are meet.

The concept of ecosystem management links spatial scales, policy levels, beneficial uses and physical processes, forming the basis for managing key species as well as community involvement in natural resource planning, education and recreation. Watershed planning will also identify opportunities for BLM to acquire important habitat needed for better management through conservation easement, rights of way, exchange, and purchase.

Riparian Management Areas

Riparian Management Areas (RMAs), synonymous with Riparian Reserves identified in FEMAT and Riparian Habitat Conservation Areas (RHCAs) in PACFISH, consist of portions of watersheds that are directly linked to streams and rivers. They are the portions of a watershed critical to maintaining natural hydrologic, geomorphic, and ecologic processes that directly affect streams, stream processes, and fish and wildlife habitats (Thomas et al. 1993; FEMAT 1993). Riparian habitat includes not only the designated riparian/streamside management zones adjacent to rivers, streams, springs, seeps, wetlands and marshes, but also the primary source areas for wood and sediment such as landslides and landslide-prone slopes in headwater areas and along streams. These areas generally parallel the stream network but also include other areas necessary for maintaining hydrologic, geomorphic, and ecologic processes.

Establishment of interim RMA widths is needed along all stream types to maintain ecological connections and healthy watersheds and to allow natural restoration of degraded watersheds. Also, RMAs of sufficient width provide the safety margin for the possibility of large, rare natural disturbance events and for gaps in knowledge and understanding about functioning systems. Riparian areas function in maintaining the quality of aquatic habitat by influencing the delivery of large wood to the stream channel and riparian areas, by providing leaf and other organic matter to streams, providing root strength for bank and channel stability, offering shade for summer and winter thermal regulation, protecting water quality functions, providing a buffer in routing sediment inputs from non- and channelized flows, providing favorable microclimate, and protecting associated wildlife species (Chen 1991; Naiman et al. 1992).

Prescribed interim riparian widths on different waterbodies were determined based on several ecological and geomorphic factors.

Chinook Salmon

(Oncorhynchus tshawytscha)

DISTRIBUTION

Coppermine River, Northwest Territories, Alaska to San Joaquin River, California

STOCKS

California - 21 (one threatened, seven at high risk); *Oregon* - 33 (16 at high risk); *Washington* - 39 (13 at high risk); *Alaska* - 25 (Yukon River Basin)

WILD ADULT STATUS

California 1967-69 - winter run averaged 86,500 fish in the Sacramento River;
Currently - winter run averaging 500 fish in the Sacramento River
Oregon Historic - coastal populations ranged from 300-600,000 fish
Currently - coastal populations range from 200-300,000 fish

LIFE HISTORY

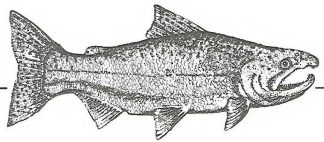
- a 2-7 year life cycle, including 3-6 months in freshwater
- three distinct runs: spring/summer; fall; and winter
- adults generally return to natal stream and die after spawning
- adults enter rivers from April through December, and spawn from September to early March
- largest of all salmon, weighing from 2 to over 100 pounds
- females lay between 3,000 to 6,000 eggs in the gravel

HABITAT REQUIREMENTS

- adults use main rivers and lower tributary reaches for spawning
- young use mainstem rivers, lower tributaries and estuaries for rearing
- need clean 1-6" gravel for spawning
- spring chinook need deep holding pools and cool water during the summer
- young need abundant logs, trees, root wads and bank vegetation for instream and bank structure and cover
- young need substantial amounts of quality estuarine habitat for rearing

IT'S A FACT

Chinook salmon, sometimes called *Kings*, are thought by most to be the best eating of all salmon.



Generally, the effects of riparian vegetation on streams decrease with increasing distance from the streambank (VanSickle and Gregory 1990). The need for interim riparian widths varies depending on the specific function to be maintained. For example, Belt et al. (1992) concluded based on a review of studies conducted in Idaho, that for non-channelized flow, sediment rarely travels more than 300 feet and riparian areas 200-300 feet in width are effective in controlling non-channelized sediment. Delivery of large wood to stream channels and riparian areas is a function of slope distance in relation to tree height and a width of one tree height away from the channel edge or edge of the riparian stand is recommended (VanSickle and Gregory 1990).

Prescribed widths of RMAs have been established for BLM land in coastal and Columbia River Basin watersheds per FEMAT and PACFISH, **but not for Alaska.** Interim RMA widths (slope distance) on either side of the stream are prescribed in terms of the height of a site-potential tree (average maximum height of the tallest 200 year or older dominant tree for a given site class); width of the inner gorge; outer edges of riparian vegetation; minimum slope distance; or site-specific geomorphic

criteria such as a 100-year floodplain, whichever is greatest. Also, both FEMAT and PACFISH incorporated management direction in the form of project and site-specific standards and guidelines, to apply to all riparian areas to meet riparian goals and RMOs. Prior to a watershed or site-specific analysis establishing final site-specific widths, minimum interim widths for five categories of waterbodies are:

MINIMUM RIPARIAN WIDTHS (ONE SIDE)

STREAM	FEMAT	PACFISH
Fish-bearing	300'	300'
Permanently flowing non-fish bearing	150'	150'
Ponds, lakes, reservoirs, and wetlands greater than 1 acre[a]	150'/300'	150'
Seasonally flowing or intermittent streams, wetlands less than 1 acre, landslides, and landslide-prone areas[b]	50'/100'	50'/150'
Non-forested rangelands		100-yr. floodplain

a- In FEMAT, 150 feet was the interim width for constructed ponds and reservoirs and small wetlands and 300 feet was the interim width for natural lakes and ponds.

b- In FEMAT and PACFISH, 50 feet was the interim width for non-Key Watersheds and the 100 and 150 feet interim widths are for Key Watersheds.

In non-forested rangeland ecosystems, the interim PACFISH widths for permanently flowing streams is the extent of the 100 year flood plain and 50 feet on each side of intermittent streams. However, if the riparian-wetland area along perennial and intermittent streams is managed under the objective to achieve an advanced ecological status or properly functioning condition, as outlined in BLM's TR 1737-9 1993,*Riparian Area Management- Process for Assessing Proper Functioning Condition*, the intent of the 100-year floodplain and RMA widths should be met. The extent of riparian habitat in Alaska has yet to be determined, but initial inventories show riparian and stream channel widths ranging from 350 feet in interior forested streams to 630 feet in coastal tundra streams (C. Kretsinger, BLM, personal communication).

Key Watersheds

Past attempts to recover anadromous fish populations were relatively unsuccessful because the problem was not approached from a watershed basis. A key watersheds concept, described in FEMAT, maintains the best of what is left and identifies watersheds with the highest potential for restoration. Key watersheds in PACFISH are designated as watersheds with (1) stocks listed pursuant to the ESA, or stocks identified in Nehlsen et al. (1991) as "at risk" or subsequent scientific stock status reviews; or (2) excellent habitat for mixed salmonid assemblages; or (3) a high restoration potential. A system of key watersheds that serve as refugia is crucial for maintaining and recovering habitat for "at risk" stocks of anadromous salmonids. These refugia include areas of good habitat as well as areas of degraded habitat. Areas in good condition will serve as anchors for the potential recovery of depressed stocks and maintenance of higher water quality. Areas of lower quality habitat should have a high potential for restoration and will become future sources of good habitat with implementation of a comprehensive restoration program. In coastal, Columbia and Alaska regions, BLM has identified 115 Key Watersheds; 26 have been designated in FEMAT, and 26 in PACFISH.

Because key watersheds are important for maintaining and restoring the best remaining habitats, they should be given special consideration. Under FEMAT, all key watersheds require watershed analysis prior to further resource management activity. BLM key watersheds, identified in each anadromous initiative, should receive higher priorities for watershed protection and restoration.

Watershed Restoration

Past management actions on and off BLM land have significantly degraded stream and riparian systems and hydrologic processes. Because of these problems, watershed-scale restoration is an integral

part of BLM's program to restore fish and riparian habitat, and water quality. Key elements in a restoration program are: control and prevention of road-related runoff and sediment production; prevention of non-road related mass failures and erosion; improved condition of riparian and upslope vegetation; and improved habitat structure in stream channels and floodplains.

Unneeded roads and roads that have been identified as detrimental to riparian and aquatic resources will be removed and restored to control ongoing erosion and eliminate the potential for catastrophic failure. In many forested areas, the most common form of stream habitat damage is caused by landsliding, gully erosion and stream channel diversions, and sediment delivery related to roads. Many existing problems are associated with older roads located in high-sensitivity areas or roads that have been abandoned. Two major proposed actions are decommissioning and replanting of unneeded roads, and upgrading or "storm-proofing" roads needed to continue land management activities.

Habitat improvement projects are needed to increase short and long-term watershed productivity. However, **proper management strategies should be in place to meet long-term watershed goals and objectives prior to scheduling habitat restoration work.** Long-term watershed restoration projects including riparian revegetation, road and culvert reconstruction or replacement, and upland stabilization, will not necessarily produce benefits in the short-term but are the highest priority for long-term watershed improvement. Channel restoration work (except for channels where placer mining has occurred) should be considered an interim, short-term measure until vegetative conditions in riparian areas reach a natural, mature condition, capable of providing a continuous source of large debris and maintaining channel and floodplain integrity. Streams presently in poor or fair condition, but unstable, will not be treated with short-term measures. However, long-term projects should be conducted in these areas to stabilize conditions if benefits justify them. *Table 5* lists the long and short-term restoration opportunities by state.

Table Five

STATE	RIPARIAN[a]	CHANNEL[b]	FISH PASSAGE[c]	WATERSHED[d] MILES	WATERSHED[d] ACRES
Alaska	537	15	-	-	-
California	6,700	26	3	1,500	-
Idaho	41,840	227	75	-	735,500
Oregon	37,650	1,235	70	7,500	20,000
Washington	50	3	-	-	107,000
TOTAL	86,777	1,506	148	9,000	862,500

a- acres; b- stream miles; c- numbers of culverts, small dams, and small waterfalls; d- miles of road and acres of uplands.

Summary of watershed restoration opportunities by state.

Funding and Staffing

BLM administers land in five states, including 13 districts, that contain anadromous fish. The late 1980s were a low point in both funding and fisheries staffing for BLM, with only between one-half and one million dollars spent annually and 17 permanent fisheries biologists working on anadromous fish issues. The *1988 Anadromous Fish Strategy* called for $2 million annually and 23 permanent fisheries biologists to implement the goals and objectives. However, by 1994 new commitments arising from the Salmon Summit increased the Bureau's program for anadromous fish to more than $11 million and 38 permanent full-time fish biologists. Continuing and new commitments from the Salmon Summit, FEMAT, PACFISH, Alaska's aquatic habitat inventory needs, and possible Federal jurisdiction for subsistence fisheries in Alaska, elevate BLM's need to fund and staff anadromous fisheries work *(Appendices 2 and 3)*. Presently, only the Coos Bay District in Oregon, with seven permanent fish biologists, is adequately staffed to accomplish the workload.

Appendices 2 and 3 contain estimates of annual funding needs for operational (plans, inventory/analysis, monitoring and support) and restoration costs and identifies existing and additional personnel. To accomplish the demands of watershed analysis and restoration, additional personnel, such as hydrologists, range conservationists, geologists, geomorphologists, recreational specialists, and contract specialists are required for implementation. *Table 6* shows priorities for funding by state.

Table Six

STATE	INVENTORY	MONITOR	W.A.[a]	RESTORATION[b] INST	RIP	UPL	RDS
Alaska	1	2	3	3	3	3	3
California	1	2	2	3	1	2	1
Idaho	1	1	1	3	1	1	2
Oregon	2	1	1	1	1	3	2
Washington	1	2	3	3	1	2	2

1= High, 2= moderate, 3= low priority; a- W.A.= watershed analysis; b- Inst= instream structures, Rip= riparian habitat, Upl= upland restoration, Rds= road restoration

Priority funding categories by state.

Coastal

INITIATIVE FOR OREGON/WASHINGTON AND CALIFORNIA COASTAL AND INTERIOR WATERSHEDS

INITIATIVE PLANNING TEAM

Neil Armantrout, Eugene District
Bob Bessey, Medford District
Jim Decker, California State Office
Dave Fuller, Arcata Resource Area
Dave Faurot, Roseburg District
Bill Hudson, Coos Bay District
Robert House, Anadromous Fish Coordinator
Dale Johnson, Medford District
Joe Kelly, Wenatchee Resource Area
Bob Ruediger, Salem District
Ron Wiley, Oregon State Office

NOVEMBER 1993

Background

Habitat conditions on BLM lands in coastal watersheds are important to conserve many of the "at risk" stocks. For example, the fall chinook run on the Shasta River (Klamath Basin) is considered at a high risk of extinction and BLM manages a significant portion of the available critical spawning area. BLM manages 1,170 miles of coastal streams in Oregon, Washington and California that are accessible to anadromous salmonids and another 37 miles of historic habitat now inaccessible above dams *(Table 7)*. Of the 1,170 miles used by anadromous salmonids, chinook salmon are found in about 330 miles, coho salmon in 820 miles, chum salmon in 2 miles, and steelhead and sea-run cutthroat trout in 1,170 miles. Another 4,125 miles of perennial and intermittent streams (some containing resident trout populations) and more than 2.2 million acres of riparian and upland habitat directly influence downstream conditions for anadromous salmonids *(Table 7)*.

In coastal watersheds of Oregon, Washington and California where BLM has management responsibility, about 19 percent of the land is under BLM ownership. Of the 146 coastal basins containing anadromous salmonids, BLM manages streamside land in 52 watersheds containing at least 120 of the 314 coastal stocks with a moderate-to-high risk rating *(Table 8)*. This includes 38 chinook, 41 coho and nine chum salmon, 27 steelhead, and five sea-run cutthroat trout stocks. In the 18 major watersheds of coastal Oregon, BLM manages 929 miles or 17 percent of the total 5,463 stream miles. In watersheds with part BLM ownership, the percentage of anadromous stream miles managed by BLM ranges from less than 1 percent to more than 30 percent *(Table 8)*. The Umpqua Watershed, located in Roseburg, Coos Bay and Medford districts, has the most miles (324 of 972 miles) and the highest percentage (35 percent) of stream miles under BLM management for any coastal basin. Other watersheds with significant BLM ownership are the Rogue River (229 of 745 miles) and the Nestucca River (49 of 197 miles) basins.

In general, most coastal runs of indigenous wild chinook salmon, coho salmon, steelhead and sea-run cutthroat are declining. To show the extent of declines in Oregon, the remainder of this section describes population and harvest trends taken from the Oregon Department of Fish and Wildlife (ODFW) report, *Status of Anadromous Salmonids in Oregon Coastal Basins*, (Nickelson et al. 1992).

Chinook salmon are the most highly prized fish of commercial and sport fishers. Since 1975, due mainly to imposed harvest restrictions to protect spawning populations, the catch of chinook in the eastern North Pacific has declined from about 3.5 million to 2 million fish. Although most north and mid-coast chinook populations

About 77% of BLM's coastal streams are presently in minimal or fair condition, with the old-growth conifer overstory removed and the channel devoid of large wood.

remain healthy, but declining, south coast populations are severely depressed. Depressed populations include: California's Sacramento winter-run and spring-run and Klamath fall-run; Oregon's lower Rogue and Illinois River fall-run; and small streams on Oregon's south coast (Winchuck, Hunter, Pistol, Euchre fall-runs). Oregon's ocean chinook harvest annually averaged 277,000 fish (239,000 commercial and 38,000 recreational) since 1971. Freshwater recreational chinook harvest in estuaries and streams averaged 53,400 fish from 1980 to 1990.

Oregon coastal rivers were closed to commercial fishing for chum salmon after 1957, except in Tillamook Bay, which remained open until 1962. In the late 1960s, a recreational fishery replaced the commercial fishery in tributaries of Tillamook Bay. Starting in 1992 the recreational fishery changed to a catch-and-release program in the Miami and Kilchis rivers. Harvest of Oregon chum salmon in offshore fisheries has not been evaluated. Annual chum landings ranged from 264,570 fish in 1928 to 1,150 fish in 1960. Chum salmon production in Tillamook Bay, which averaged around 130,000 adults during the 1930s, decreased to an average of about 37,000 fish from 1948 to 1968 and dropped to an average of 21,000 fish from 1969 to 1991. Based on current evidence, the maximum potential chum run has decreased in Tillamook Bay to about 46,000 fish under existing environmental conditions. Other coastal basins retain only much smaller remnant runs.

Table Seven

STATE/DISTRICT	BLM STREAM MILES[a]			ACRES (000's)[b]	
	EXISTING	HISTORICAL	INFLUENCING	BLM	TOTAL[c]
Washington					
Spokane	8	0	1	1.8	?
Oregon					
Salem	136	2	143	172.7	1,934.1
Eugene	134	0	135	127.0	501.8+
Roseburg	192	15	645	423.0	3,520.0
Medford	264	0	1,701	767.9	2,398.8
Coos Bay[d]	216	10	250	329.0	2,460.0
TOTAL (OR/WA)	950	27	2,875	1,821.4	10,814.7+
California					
Ukiah	220	10	1,250	423.0	1,060.0
GRAND TOTAL	1,170	37	4,125	2,244.4	11,874.7+

a- Existing stream miles currently contain anadromous fish, historical miles are streams with unnatural blockages to fish migration without passage, and influencing streams are perennial or intermittent miles (generally 3rd order and larger) influencing conditions in streams used by anadromous salmonids. b- Acres of BLM land in subbasins containing anadromous salmonid stocks. c- Total acres in watersheds affected by BLM management. d- Includes 13 miles of stream in scattered tracts, that are not listed in Table 10.

Anadromous salmonid habitat on BLM lands in coastal streams of California, Oregon, and Washington.

In Oregon, coastal coho salmon stocks (OCN and public hatchery combined) contributed about 10 percent of the total regional coho stock abundance from 1971-77 compared to 33 percent during 1985-91. Relative to ocean harvest, the Oregon coastal coho are estimated to have contributed about 39 percent (850,000 coho) of the average yearly catch from 1971-77 and about 33 percent (264,000 coho) of the catch from 1985-91. Also from 1971-91, Oregon coastal stocks contributed an average estuary and river harvest of 16,000 fish. The OCN coho represent the largest remaining wild stock aggregate in the U.S. outside of Alaska. Even though harvest rates on OCN stocks have dropped from the 70-90 percent range prior to the early 1980s to 25-60 percent since 1984, the stocks have continued to remain depressed compared to population sizes of the 1960s and early 1970s.

Steelhead trout are a popular sport fish in California, Oregon and Washington. In Oregon, coastal steelhead were commercially harvested until 1975, when they were declared a gamefish and all commercial harvest was discontinued. The peak commercial landings were estimated between 100,000 and 120,000 fish in the 1920s, declining to almost nothing by 1949. In the last 20 years, the

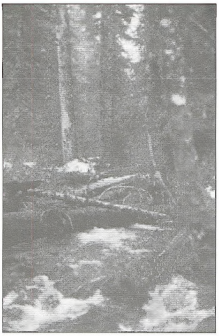
Table Eight

DISTRICT	ANADROMOUS STREAM MILES BLM	TOTAL[a]	LISTED	STOCKS AT RISK^ AT RISK
Spokane				
Nooksack	2	65		Chs,Co,Stw,Sts,Ct
Skagit	4	94		Chf,Chs,Co,Ct
Misc. coastal[1]	2	?		Chf,Chs,Co,Stw, Sts,Pi,Ct
Salem				
Nehalem	5	360		Chs,Co,Stw,Ct
Tillamook B.tribs[2]	13	270		Chs,Co,Cu,Stw,Ct
Nestucca[3]	49	197		Chs,Co,Cu,Stw,Ct
Salmon	1	40		Chf,Co,Cu,Stw,Ct
Siletz	18	203		Chs,Co,Cu,Stw,Sts,Ct
Yaquina	1	156		Chf,Co,Cu,Stw,Ct
Alsea[4]	49	322		Chs,Co,Cu, Stw,Ct
Eugene				
Siuslaw[5]	134	706		Co,Stw,Ct
Roseburg				
Umpqua	48	972		Co,Cu,Ct
North Umpqua	48			Ct
South Umpqua	96			Chs,Co,Ct
Medford				
Rogue[6]	200	745		Chf,Co,Sts,Ct
S. Umpqua	36			Chs,Co,Ct
Illinois	28			Chf,Co,Stw,Ct
Coos Bay				
Chetco	2	46		Chf,Co,Stw,Ct
Pistol	2	35		Chf,Co,Stw,Ct
Hunter	3	34		Chf,Co,Ct
L Rogue tribs	1	55		Chf,Co,Sts,Ct
Elk	1	20		Chf,Co,Cu,Ct
Sixes	3	105		Co,Cu,Stw,Ct
Coquille[7]	68	889		Chs,Co,Cu,Ct
Coos	25	256		Chf,Co,Cu,Stw,Ct
Smith[8]	75	249		Chs,Co,Cu,Stw,Ct
L&M Umpqua	21	209		Co,Cu
Floras/New River	2	107		Chf,Co,Ct
TOTAL (OR/WA)	937	5,976		
Uhiah				
Sacramento	47	1,700?	Chw	Chs,Stw
Klamath[9]	48	1,171		Chf,Chs,Co,Sts
Mattole (King Range)	42(42)	120(?)		Chf,Co
Eel[10]	41	?		Chf,Co,Sts,Ct
TOTAL (CA)	178(42)	2,991 +		
GRAND TOTAL	1,115	8,967 + 1		120

1. Includes stocks at risk in the Snohomish, Clearwater, Stillaquamish Rivers, Puyallup, Dungeness, E. Twin and Hoko Rivers. 2. Includes stocks at risk in the Wilson, Trask, Kilchis and Tillamook Rivers. 3. Includes stocks at risk in the Little Nestucca River. 4. Includes stocks at risk in the tributaries North of the Alsea River. 5. Includes stocks at risk in the North Fork Siuslaw River. 6. Includes stocks at risk in the Middle Rogue River tribs. 7. Includes stocks at risk in the South Fork Coquille River. 8.Includes stocks at risk in the Lower Umpqua River. 9. Includes stocks at risk in the Shasta, Scott, Trinity, North Fork Trinity, and Mad Rivers; Redwood Creek; and tributaries of Humbolt Bay and Lower Klamath River. 10. Includes stocks at risk in the Van Duzen and North Fork Eel Rivers

a- Stocks identified by Nehlsen et al 1991, Nickelson et al. 1992, Higgins et al. 1992, and WDF et al. 1993 as at high risk, moderate risk, special concern, critical and depressed. Chs, Chf and Chw= spring, fall, and winter chinook salmon, Stw and Sts= winter and summer steelhead, Co=coho salmon, Cu= chum salmon, Pi= pink salmon, and Ct= sea-run cutthroat trout. b- Total stream miles in coastal Oregon are those listed in ODFW Coho Salmon Plan (1982).

Major watersheds containing BLM lands with anadromous salmonids.



Only 33% of BLM streams along the coast are in optimal condition, still flowing through predominantly old-growth forests.

estimated sport harvest of hatchery and wild steelhead in Oregon coastal streams ranged from 144,700 in 1974-75 to 54,000 in 1982-83. Most of the present day steelhead catch is winter-run fish, and prior to 1950 the catch, was primarily wild fish. In the last 18 years, 15 of the 24 populations of steelhead in streams with annual catches exceeding 200 fish had below average runs. Also, since the mid- 1970s, hatchery smolt releases have remained constant.

Sea-run cutthroat provide a popular sport fishery in the central and upper tidewater reaches of many coastal rivers. At the Sea-Run Cutthroat Symposium (Reedsport, Oregon, October 12-14,1995), fish biologists from British Columbia to California stated many sea-run cutthroat stocks are depressed and at risk of extinction. However, present stock status and trend analyses are difficult to determine due to limited population surveys and long-term data bases. Nevertheless, limited information from creel and dam counts have raised concerns that sea-run populations in most coastal drainages are experiencing widespread declines, especially in Oregon and Washington. In fact, the best long-term source of information, dam counts on the North Umpqua River, reveal wild populations have declined to the point of near extinction.

Current Condition of Watersheds

The current condition of riparian habitat and stream channels on coastal BLM lands ranges widely among districts in Oregon and California *(Table 9)*. Current condition information for Oregon was taken from the draft western RMPs and California from completed RMPs. In Oregon, 55 percent of riparian acres are in minimal (overstory trees less than 10 inches in stem diameter) to fair (overstory trees greater than 10 inches and less than 20 inches in stem diameter) condition, most having been logged in the last 50 years. In California, 73 percent of the riparian acres are in minimal conditions, while only eight percent are in optimal (overstory trees greater than 20 inches in stem diameter) condition. Stream channels are in a condition similar to riparian areas in Oregon and California, with 64 percent and 93 percent in minimal or fair condition, respectively. Channels are in a decreasing trend, containing little LWD and few quality pools, with some experiencing water quality and sedimentation problems *(Table 9)*.

WATERSHEDS

Washington. The Spokane District manages land in 32 watersheds of varying size in western Washington. All of the BLM lands are scattered parcels that range in size from less than one acre to 120 acres. The number of BLM acres per watershed ranges from less than five acres in several watersheds to 978 acres in the Skagit River basin. Although the Skagit River acreage area encompasses only a small portion of the watershed, BLM will participate in a coordinated planning effort for those portions of the Skagit River watershed containing stocks at risk.

Coastal Oregon. The draft western Oregon RMPs considers cumulative conditions on selected watersheds. The analyses, which examined vegetation, management actions, soils, slope/aspect, precipitation,

flow changes, and landslide potentials, determined that most potential decreases in habitat conditions within watersheds could be attributed to activities on private land. However, because current conditions on BLM lands are below optimum levels, overall conditions are not expected to significantly improve in the next ten years.

California. BLM has been a member of the Trinity River Basin Fish and Wildlife Task Force since 1974. The task force was formed to find solutions to losses in fish and wildlife after the Trinity River Dam project was completed in 1963. In 1982, the Trinity River Basin Fish and Wildlife Restoration Act (PL 98-541) was established to fund and implement a $57 million restoration program. The act, assigned to the U.S. Department of Interior to implement, created a 14-member agency task force to oversee the restoration program. The Ukiah District administers 21 miles of tributary streams and 20 miles of the Trinity River. The Trinity River holdings are especially important, since they are immediately below the dams and are the upper limit for anadromous fish. BLM is now the largest landowner in Grass Valley Creek, the major producer of sediment to the Trinity River. Overall, conditions in northern California are not expected to improve significantly over the next ten years under any management strategy, since most streams and riparian areas are below optimum conditions.

Table Nine

	HABITAT CONDITION[A]					
	RIPARIAN(ACRES)[B]			STREAM CHANNEL(MILES)[C]		
ST./DIST.	MINIMAL	FAIR	OPTIMAL	MINIMAL	FAIR	OPTIMAL
Washington						
Spokane	48	317	35	1	6	1
Oregon						
Salem	4,774	3,304	4,211	74	52	44
Eugene	2,539	878	1,712	29	98	71
Roseburg	7,018	5,518	6,344	295	219	242
Medford	7,278	11,902	22,033	155	178	196
Coos Bay	5,973	2,585	8,044	127	54	175
OREGON TOTAL	27,582	24,187	42,344	680	601	728
California						
Ukiah	11,898	3,093	1,217	163	42	15
GRAND TOTAL	39,480	27,280	43,561	843	643	743

a- Characteristics of the condition classes are generally as follows: *minimal* - major alterations in watershed or water quality/quantity, natural stream habitat and riparian areas; few or no large trees or mature native vegetation in riparian areas; little or no large woody debris (LWD); pools few and shallow; and excessive sedimentation of streambed; *fair* - watershed moderately impacted by activities; natural riparian vegetation altered or removed in past (few large trees); limited amounts of LWD; fine sediments above natural levels; some adverse changes in water quality/quantity; habitat partly recovered or still in decreasing trend; *optimal* - watershed not greatly impacted, riparian areas near natural conditions; abundant, diverse instream structure; numerous deep, complex pools with cover; substrate(gravels) relatively free of fine sediment; stable banks and channels; water quality/quantity generally unaltered from natural conditions. b- Condition of riparian zone (Oregon 3rd order and larger) is based on the composition and condition of existing vegetation compared to the potential site specific native plant composition and condition. c- Stream channel miles are those containing salmonids. Stream condition ratings are based on inventory data, riparian conditions, or best available credible information.

Condition of riparian and aquatic habitat in BLM watersheds containing anadromous and/or resident salmonids.

RIPARIAN CONDITIONS

In coastal watersheds supporting salmonids, about 110,321 acres of riparian habitat along perennial streams is managed by BLM *(Table 9)*. Approximately 39,480 acres (36 percent) are in minimal condition and 43,561 acres (39 percent) are in optimal condition. In Oregon, Medford (53 percent) and Coos Bay (49 percent) Districts have the highest percentage of mature/old-growth riparian vegetation, while Salem, Eugene, and Roseburg Districts have only about 33 percent of riparian vegetation in optimal conditions. In California, approximately eight percent of the riparian vegetation is in optimal condition.

The Spokane District has information about the location of the 400 acres of riparian habitat in western Washington, but only limited information on the condition of these habitats. Acquiring riparian condition information is a management priority.

CHANNEL CONDITIONS

Of the 2,229 miles of stream with anadromous and/or resident salmonid populations on coastal lands managed by BLM, 843 miles (38 percent) are in minimal conditions and 743 miles (33 percent) are in optimal condition (Table 9). The remaining 643 miles (29 percent) are in fair condition, with limited amounts of LWD, fine sediments above natural levels, some adverse changes in water quality/quantity, and habitat partly recovered or remaining in a decreasing trend. In addition to 5,332 miles of fish and non-fish bearing perennial streams that directly affect conditions in anadromous streams, another 11,000 miles of intermittent streams originate or flow through BLM lands and influence conditions on fish-bearing streams (FEMAT 1993). Channels currently downcut or excessively widened, diverted, and lacking quality pool habitat, complexity, associated floodplains, and structural elements (LWD), were considered to be in minimal condition. Conversely, channels with sufficient floodplains, ample quality pool habitat, and sufficient amounts of structure and the potential to maintain structure, were considered to be in good to optimal condition. The Spokane District has eight miles of stream scattered in parcels within 11 watersheds containing salmonid stocks at risk. Although the location of these stream miles is known, there is no information on the condition of the aquatic habitat. Acquiring instream habitat condition will be a high priority for the coastal salmonid initiative.

FISH POPULATIONS

Two factors account for reduced numbers of anadromous salmonids leaving BLM streams compared to historic levels: habitat degradation and stock management. Past management practices reduced the capability of habitat on BLM coastal streams to produce young fish during the spawning and early life history cycles. Stock management practices reduced the number of spawners entering streams, so that many streams are under seeded and never reach their productive potential. The Nestucca watershed is an example of how coho salmon populations have changed over the last 40 years. Based on historical records (Cleaver 1951), the Nestucca River tributaries once supported a run of more than 30,000 coho salmon spawners, averaging at least 75 spawners/mile from 1923 through 1927. Elk Creek (the major tributary in the upper Nestucca River) still had high numbers of coho spawners (59 spawners/mile) as late as 1970, but recent counts from 1983 to 1986 averaged only four spawners/mile. After three years (1986-1989) of rehabilitating 2.5 miles of Elk Creek at a cost of $110,000, coho numbers increased to an average of more than 20 spawners/mile from 1987 to 1992 (including 54 spawners/mile in 1992), but coho returns still remain low throughout the rest of the Nestucca watershed (about 500 spawners in 1992), averaging around three or less spawners/mile.

Past Management Efforts

Since the early 1960s, awareness of fisheries and watershed values, and actions to improve protection of fish habitat have increased. State Forest Protection Acts were adopted by Oregon, Washington and California to provide more protection. BLM and the USFS initiated land-use allocations and forest management guidelines to give more consideration and protection to anadromous fish habitats. Buffers (vegetative strips) of varying widths are routinely left along fish-bearing streams to protect riparian area values. Originally these vegetative strips consisted mainly of hardwood overstories, but since the early 1980s stream buffers on some BLM and USFS lands have been taken out of the timber base and conifers as well as hardwoods were left along fish-bearing streams. Other practices, such as cable yarding with partial and full suspension and road and landing construction, are designed to minimize erosion and sedimentation of fish-bearing streams. Since the early 1980s, removing large wood and massive log jams are no longer routinely practiced. Starting in the mid 1980s, BLM pioneered much of the stream improvement work aimed at replacing lost woody structure to improve summer and winter rearing

Sea-run Cutthroat Trout

(Oncorhynchus clarki clarki)

DISTRIBUTION

Prince William Sound, Alaska, to Eel River, California

STOCKS

California - 5; Oregon - 1 (however, ODFW has identified 92 distinct populations); *Washington* - 1

WILD ADULT STATUS

Limited information on population trends, however most biologists believe current numbers are far below historic levels due to habitat loss.
1946-56 - sea-runs averaged 950 fish/year over Winchester Dam, North Umpqua River, Oregon
1960 - runs declined to less than 100 fish over Winchester Dam
Currently - runs have only exceeded 100 fish twice over Winchester Dam since 1980 and are now considered near extinct by biologists

LIFE HISTORY

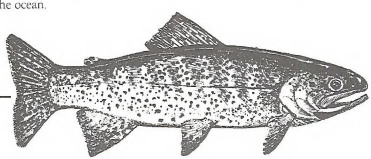
- life cycle ranges from 2 to 6 years, with generally only less than one year in saltwater
- two major life history patterns; migratory and resident
- adults move in and out of estuaries during the year and spawn from December to May (peaking in December and February)
- adults may spawn more than once
- spawned out adults, called "kelts," return to the ocean in late March to early April
- adults can exceed 20" in length and over four pounds
- adults generally move in large schools before and after migration

HABITAT REQUIREMENTS

- most adults spawn in small to medium streams
- young require complex channel margins and backwater habitat in spring
- young prefer complex pools with woody cover during the summer
- young need complex slack water pools and side channels during winter high flows
- adults and young need good quality/quantity estuarine and tidal river habitat during migrations
- need complexes of small and large wood for all life stages
- need clean one-half to 2" gravel for spawning

IT'S A FACT

Sea-runs, the migratory form of resident cutthroat trout found throughout the West, are called *bluebacks* by fishermen because of the color of their backs as they come from the ocean.



habitat. Biologists working on BLM districts over the last 14 years have generated 36 publications, technical notes, articles, and management reports from work conducted on coastal watersheds *(see references and completed studies)*.

Past Rehabilitation Efforts

SHORT-TERM RESTORATION

Instream restoration is considered an interim, short-term measure conducted in stable, once-productive streams that have experienced adverse impacts from past land management activities and natural events. Instream habitat restoration without accompanying changes in watershed management cannot provide long-term improvements, but may provide a means to facilitate short-term recovery of at risk stocks or to supplement watershed-scale restoration efforts.

BLM has employed a variety of techniques to increase channel complexity and stability in degraded stream reaches. Stream reaches considered to be in optimal condition have not been treated. Since 1975, BLM has spent about $2,059,000 to improve 194 miles (an average of $10,600/stream mile) and $1,563,000 to provide access/passage on 339 miles of stream in western Oregon and California *(Table 10)*. Most of the work was completed in the last ten years.

Oregon

SALEM. The Salem District has had an active coastal anadromous stream restoration program since 1981, with early efforts concentrating on spawning and summer rearing habitat using gabions. Recent efforts involved utilizing natural materials such as large woody material and boulders to improve overwintering habitat (House et al.1989). Recently, the Salem District worked cooperatively with an ODFW research group to evaluate restoration projects in East and Lobster Creeks. These projects were constructed to improve overwintering habitat and to conduct long-term habitat and fish monitoring to determine if improvement techniques were increasing anadromous fish production. To date, the Salem District has spent $595,100 on 15 instream rehabilitation projects since 1981, treating 30 miles of stream ($19,833/stream mile) in the Alsea and Nestucca drainages *(Table 10)*.

EUGENE. The Eugene District began constructing habitat improvements in 1969, but the majority of work was conducted between 1984 to 1987, with $850,000 spent to improve 11 miles of stream ($9,100/mile) and provide anadromous fish passage to more than100 miles of stream *(Table 10)*. Approximately $750,000 was spent in 1988 to create fish passage at Lake Creek Falls, which allowed access to more than 100 miles of stream. Also, 11 miles of stream in the Siuslaw River basin were treated with instream structures and blasting bedrock to create pools to improve spawning and summer and winter rearing habitat.

BLM manages most of the Mattole River estuary (California). Such areas are extremely important for salmonid survival in coastal watersheds from California to Washington.

ROSEBURG. Since 1985, the Roseburg District spent $219,000 treating ten miles of stream in the Umpqua River basin *(Table 10)*. Completed work included installing structures, blasting pools, and creating off-channel areas to benefit salmonid spawning and summer and winter rearing habitat.

MEDFORD. The Medford District spent $275,000 since 1971, treating seven miles of stream (21 projects) and improving passage to 153 miles in the Rogue, Illinois and South Umpqua River basins *(Table 10)*. Work included improving fish passage and installing structures to improve access and spawning and summer and winter rearing habitat. Initial efforts, which focused on providing fish passage over natural barriers and diversion dams, were accomplished with help from Rogue Flyfishers and ODFW.

COOS BAY. The Coos Bay District spent $1,018,000 since 1975 to improve 38 miles of stream in the Umpqua, Coos and Coquille River basins, and access 79 miles of anadromous fish habitat *(Table 10)*. Work has included installing and maintaining structures to improve spawning and summer and winter rearing habitat.

California

UKIAH. Ukiah District spent $566,000 since 1977 treating 98 miles of stream ($5,800/mile) in the Klamath, Eel and Mattole watersheds *(Table 10)*. Projects include construction of experimental side channels to partially restore stream reaches lacking critical salmonid rearing habitat. Also, more than 50 log jams have been modified to provide better passage to more than 80 miles of salmonid spawning and rearing habitat.

Long-term Restoration

About 15,532 miles of BLM roads in Oregon and California potentially influence stream conditions in coastal watersheds (FEMAT 1993). Restoration of degraded riparian areas, stabilization, obliteration and maintenance of roads, and upland stabilization and revegetation all improve watershed conditions over the long-term. Long-term conservation strategies, employing best management practices during timber harvest and road construction, protection of riparian areas and active restoration efforts are the least costly and most effective methods to protect and restore watersheds and the streams they support.

RIPARIAN HABITAT

Restoration of riparian areas along coastal streams is a relatively new BLM management tool. To date, due to lack of funding, around 900 acres of riparian habitat dominated by young stands of red alder has been treated by Salem, Eugene, Medford and Ukiah districts.

Oregon

The Salem District spent approximately $100,000 since 1987 to treat more than 460 acres of riparian habitat that was dominated by young stands of red alder and lacking young or mature conifers. Riparian habitat along 19 miles of stream has been treated with more than 50,000 conifer seedlings in the Nestucca and Alsea drainages. Riparian underplanting, mostly with western redcedar and a mixture of western hemlock, Douglas-fir and Sitka spruce, has been conducted on the upper Nestucca River (1987-1993), East Creek (1990), East Beaver and Elk Creeks (1991), Bear Creek (1994) and upper Lobster Creek (1994). The Tillamook Resource Area completed a report titled "Streamside Forest Management Plan for the Upper Nestucca Basin of the Northern Coast Range," which outlines a strategy to re-establish conifers in hardwood and brush-dominated streamside stands (Kral et al. 1993). In 1985, the Eugene District started a limited riparian restoration program, underplanting about 20 acres

of young red alder stands with western redcedar. In 1993 and 1994, the district underplanted another 110 acres of riparian habitat along 12 miles of stream in the Siuslaw Basin. Also, the district initiated an experimental program to study the effectiveness of alder thinning and conifer releases in riparian zones, Results so far have been mixed, with predation from wild ungulates reducing survival in some areas, while thinning, tubing, planting other tree species and using older, larger trees produced more favorable results. In the Medford District, riparian restoration has concentrated on replanting conifers on inactive placer mining claims where past activities removed conifers in streamside areas.

Table Ten

DISTRICT/BASIN	YEARS	PROJECT[A] TYPE	MILES[B] TREAT	MILES[B] ACCESS	OBJECTIVE[C]	COST (000's)
Salem						
Nestucca	1983-94	I,O,R,M	19		S,SR,WR	450
Alsea	1981-94	I,O,R,M	11		S,SR,WR	145
Eugene						
Siuslaw	1984-92	I,P,R,M,W	11	100	S,SR,WR,A	850
Roseburg						
Umpqua	1985-92	I,O,P	10	6.5	S,SR,WR	219
Medford						
Rogue	1971-90	P,I	4	140	A,S,SR,WR	58
S. Umpqua	1981-87	P,I	2	13	A,S,SR,WR	171
Illinois	1983-86	I	1		S,SP,WR	46
Coos Bay						
Umpqua	1975-94	I,P,R,M	16	22	S,SR,WR	356
Coos	1981-94	I,M	10	5	S,SR,WR,A	173
Coquille	1981-94	I,P,R,M	12	52	S,SR,WR	589
OR. TOTAL			96	338.5		3,057
Ukiah						
Klamath	1977-93	P,R,W	8		S,SR,A	150
Sacramento	1977-93	P,R,W			S,SR,A	50
Mattole	1977-93	P,R,W	80		S,SR,A	280
Eel	1977-93	P,R,W	10		S,SR,A	85
GRAND TOTAL			194	338.5		3,622

a-I= instream structures, O= off-channel construction, P=fish passage, R= riparian under planting, M= maintenance/reconstruction, W= watershed/road improvements. b- Miles include treated and accessed. c- S=spawning, SR=summer rearing, WR=winter rearing, A=access

Past rehabilitation efforts.

California

The Ukiah District has successfully reestablished riparian vegetation on 300 acres along streams used by salmonids. RMPs address the need to improve riparian areas by identifying them as Areas of Critical Environmental Concern.

WATERSHEDS/ROADS

In the last 5-10 years, BLM in Oregon and California blocked access, returned roads to their original slope, and/or rehabilitated 252 miles of road in coastal watersheds. Of the 15,532 miles of road on BLM that potentially influence stream conditions, an estimate of 3,100 miles (20 percent) should be decommissioned and 7,760 miles (50 percent) upgraded (FEMAT 1993).

Oregon

Salem District, in the last 5-10 years, blocked access on six miles of road and has revegetated 12 acres of roadside area. Eugene District blocked or rehabilitated five roads, totaling eight miles. Roseburg District, over the last five years, revegetated 350 acres of road cutbanks, blocked ten miles of dirt roads, put five miles of road to bed, and installed water bars for erosion control on two miles of road. Medford District, over the last ten years, revegetated 200 acres of bare soil, pulled one-half mile of road back to its original slope, put 30 miles of road to bed, blocked access to 40 miles of road, and revegetated and stabilized rock quarries. In Coos Bay, 60 miles of road have been blocked to prevent access old trouble spots revegetated or water barred for erosion control.

California

Ukiah District eliminated 30 miles of abandoned logging roads, returning the terrain to its natural slope.

Project Monitoring

Monitoring stream restoration projects provides many benefits. Most important is the opportunity to demonstrate that well-conceived projects, addressing limiting factors and creating substantial amounts of preferred habitat, can increase salmonid production even during times of limited spawner escapement. Monitoring in the Salem and Eugene Districts has shown this is occurring in many of the treated streams. The Salem District started a stream restoration program in 1980, evaluating under different intensities 15 projects on ten streams in the Nestucca and Alsea drainages (House et al. 1989). The findings from long-term monitoring of selected projects reveal some restoration work has achieved habitat, biological, structural and economical success.

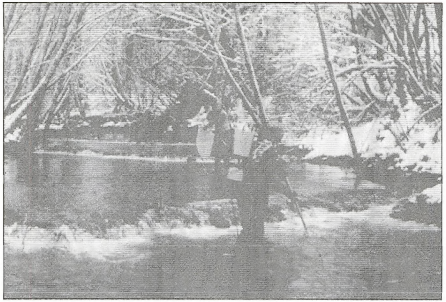
HABITAT

Eleven projects in the Salem District that were evaluated for detailed habitat changes showed increases in water surface area and shifts in habitat types, generally an increase in pools and a decrease in riffles (House et al. 1989). Summer and winter rearing habitat, as well as spawning habitat, increased substantially in treated reaches. Similar results were found after evaluating stream restoration projects in the Eugene (Armantrout 1991) and Medford Districts.

FISH POPULATIONS

Summer juveniles. Reaches in seven streams in the Salem District were

Restoration of BLM's degraded riparian areas has received a high priority. This area along the Nestucca River (Oregon) was replanted in 1987.



BLM has monitored coastal stream restoration projects for up to 15 years, determining structural success, changes in habitat and fish populations, and cost benefits.

evaluated before and after treatment for changes in numbers of coho salmon, steelhead and cutthroat trout summer juveniles. All projects showed increases in all species, however, increases varied depending on the level of treatment and the size of the stream treated. Generally, projects on larger streams with an intense level of treatment produced the greatest increase in summer juveniles (House et al. 1989). Treated streams with long-term intensive monitoring showed increases in summer juvenile populations of about fivefold, three-fourfold, and twofold, respectively, for coho salmon, steelhead and cutthroat trout young. In the Medford District, low summer streamflows limit anadromous fish production through elevated water temperatures and reduced pool quality. Stream restoration projects constructed since 1985, have increased preferred salmonid rearing habitat, with three to five times as many juvenile coho salmon, steelhead and cutthroat trout in treated reaches compared to nearby untreated reaches.

Adult spawners. In the Salem and Eugene Districts, structures in treated stream reaches have substantially increased the amount of spawning areas, and in most streams adult spawners and numbers of redds (Armantrout 1991, House et al. 1989). Long-term monitoring in restored stream reaches has shown two to fivefold increases in adult coho salmon and twofold increases in adult steelhead spawners after treatment. In Elk Creek, a tributary to the Nestucca River that was subjected to intensive habitat improvements in a 2.5 mile reach, coho salmon spawning activity is four times higher than in pre-project years and has steadily increased while other tributaries in the watershed have steadily decreased during the same period (Crispin et al. 1993). In the 1992 spawning season, Elk Creek had 54 coho spawners/mile while other tributaries in the Nestucca River basin ranged from 0 to 9 coho spawners/mile. Of the 509 coho spawners entering the Nestucca drainage in 1992-1993, 135 (26 percent) spawned in 2.5 miles of Elk Creek, which makes up only two percent of the total 139 miles of stream useable for spawning in the Nestucca River (unpublished data, ODFW and Salem BLM). The Eugene District completed ten years of spawning ground counts for coho and chinook salmon and steelhead on about 65 coastal streams (80-100 miles annually) to monitor habitat trends and stream restoration projects. Preliminary results from monitoring in Eugene showed current management strategies were not impacting spawning areas; spawner use shifted and responded favorably to project areas; and counts of all species in most streams declined. In the Medford District, spawning surveys in 15 streams

have shown three to 15 times more redds in treated stream reaches compared to neighboring untreated areas. Adult fish have also used artificially created pools to rest and escape predation.

Smolts. The Salem District completed two winter habitat restoration projects, one each in the Nestucca and Alsea Rivers. In six to seven years of monitoring young to smolt survival and/or smolt production of these projects, ODFW (in cooperation with BLM) has shown increases in survival and/or smolt numbers ranging upward of fourfold for coho salmon, four-to-sevenfold for steelhead, and fourfold for sea-run cutthroat trout compared to pre-project survival and/or numbers in treated streams and pre- and post numbers in control streams.

STRUCTURES

In the Salem District, the success of instream structures providing intended habitat was extremely high for all projects (House et al. 1989). Generally, overall success was reflective of channel stability, not stream size. Of the 1,610 wood and boulder structures installed in the Nestucca and Alsea drainages since 1981, only 38 (2 percent) either failed or had to be repaired. The Medford District has installed 450 boulder/wood structures since the mid-1980's with no failures and only minimal (less than 5%) maintenance. The high success rate was because structures were planned and constructed by experienced biologists and most structures have not been subjected to major floods. However, some instream habitat modification projects in the Pacific Northwest have been criticized as ineffective because of inadequate planning and evaluation (Frissell and Nawa 1992).

BENEFIT/COST

Studies have shown the best long-term economic alternative to protect and maintain salmonid productivity in streams is through maintenance of mature coniferous riparian zones (House et al. 1990). However, short-term stream restoration projects, which are constructed after intensive watershed surveys identify factors limiting fish production, have shown benefits far outweigh costs over a 20 year period. Although cost effective, short-term restoration projects are expensive (up to $40,000/mile) and can only be applied on about 20 percent of the 2,229 miles of coastal stream presently supporting anadromous and/or resident salmonids. However, if short-term restoration projects can produce the increases in salmonid smolts that resemble those in the Alsea and Nestucca studies, it follows that good long-term watershed protection of those components necessary for optimum salmonid production will achieve similar results.

Management Implementation

WATERSHED ANALYSIS

Plans will be developed for appropriate-sized watersheds depending on the issues, but generally will encompass watersheds about 10,000 to 100,000 acres. Coordinated Watershed Plans will be developed under the review and cooperation of BLM, USFS, USFWS, NMFS, state fish and wildlife agencies, other appropriate management agencies, and interested publics within the total watershed. Subbasin plans will be developed only by BLM in partial watersheds where the Bureau manages most of the land. Subbasin plans will be primarily a BLM effort to determine limiting factors and management strategies prior to starting a restoration program. *Table 11* shows a total of 18 completed and 97 proposed basin and subbasin plans for all districts. Coordinated watershed plans can act as recovery plans and possibly prevent listing of petitioned salmonid stocks. Completion of watershed

Table Eleven

DIST./WATERSHED	WATERSHED PLANS[a] BASIN PLANS COMPLETED	BASIN PLANS PROPOSED	SUBBASIN PLANS COMPLETED	SUBBASIN PLANS PROPOSED
Spokane		0		
Salem				
Tillamook Bay		4		2
Nestucca	1			6
Siletz		2		1
Alsea		2	4	4
Eugene				
Siuslaw		2	1	4
Roseburg				
Umpqua	2	1		5
Medford				
Rogue		1		20
S. Umpqua		1		1
Illinois		1		4
Coos Bay				
Chetco		1		1
Coquille		1		3
Floras/New River		2		2
Coos		1	1(HMP)	1
Umpqua	1(CRMP)	3	1	11
TOTAL (OR/WA)	4	22	12	65
Ukiah				
Klamath		1		1
Sacramento		1		1
Mattole	1(MRC)	1	1(MRC)	2
Eel		1		2
GRAND TOTAL	5	26	13	71

a- Basin plans are coordinated plans involving all land management and regulatory agencies in the watershed, while smaller subbasin plans involve BLM where they are the dominate landowner. HMP= Habitat Management Plan. CRMP= Coordinated Resource Management Plan. MRC= Mattole Restoration Council.

Coordinated watershed plans and BLM subbasin plans.

analyses would take about two-to-four workmonths (4-person team) for a subbasin and eight workmonths (4-person team) for a basin. Typical skills necessary to conduct watershed analysis include hydrology, forestry, fisheries and geomorphology. Other skill needs will vary depending upon characteristics of each watershed. All analyses will be completed in five years. To update completed plans, one workmonth/district/year was allotted.

While these actions alone will not ensure recovery of imperiled stocks, employing watershed (ecosystem) management techniques will "buy time" to address the myriad of anadromous salmonid problems.

Stream inventory and evaluation. Although BLM has completed detailed instream habitat inventories on about 773 miles of stream and 17,172 acres of riparian habitat, another 1,509 miles of stream and more than 68,000 acres of riparian habitat needs to be inventoried or reinventoried in coastal watersheds *(Table 12)*. New stream habitat inventories will use ARIMS, which is compatible with past survey methodology (USFS [Hankin and Reeves 1988], ODFW [Salmon Trout Enhancement Program], and BLM [Handbook H-1734-1, OSO]). Although baseline inventory information has been collected in many streams in Oregon and California, much of the information is not current or incomplete for identifying factors limiting fish production within individual watersheds or subbasins. Also, little if any data has been put into a digital format for rapid analysis and processing. This is a priority so that BLM will be able to model, analyze, and monitor implementation of management options. Priorities will be given to streams with salmonid stocks or other species at high risk and key watersheds. Intervals for conducting habitat surveys will depend mainly on whether major land disturbance events/activities occur in the watershed or as adjacent riparian habitat moves through successional stages of development

(i.e. early, mid, late successional, and climax). Costs of conducting field habitat surveys, inputting data into a digital data base, and analysis are approximately $1,500/mile. All stream inventories will be completed in the first five years, with an annual five percent re-inventory on all stream miles the last five years.

WATERSHED/PROJECT MONITORING/EVALUATION

Monitoring and evaluation are important components of a watershed management strategy. Specific activities prescribed by watershed analysis will be evaluated to determine if practices were implemented as prescribed and if the practices are effective. Effectiveness monitoring is conducted by measuring selected physical and/or biological variables that directly respond to management practices for a particular watershed. *Table 13* lists 100 long-term and project studies proposed by all districts to adequately monitor changes in habitat conditions, fish populations and implementation of completed watershed plans. In addition, long-term costs for effectiveness and validation monitoring of representative watersheds are included. Long-term monitoring of representative watersheds is the best and least costly method of assessing whether goals, objectives

Coho Salmon
(Oncorhynchus kisutch)

DISTRIBUTION

Point Hope, Alaska, to Monterey Bay, California

STOCKS

California - 22 (seven at high risk); *Oregon* - 59 (12 at high risk); *Washington* - 54 (seven at high risk)

WILD ADULT STATUS

Turn-of-the-century - Numbers ranged from one to four million
1960-1970s - Numbers ranged from one-half to one million
1980-present - Numbers around 100,000, with downward trend

LIFE HISTORY

- three year life cycle, with one year in freshwater
- adults generally return to their natal stream and always die after spawning
- adults spawn from mid-November through March
- survival:
  - females lay an average of 2,500 eggs in gravel
  - of the 2,500 eggs, about 500 young (4-5" in length) reach the ocean
  - of the 500 young, 5-30 adults (averaging 3 feet and 8 pounds) are produced, depending on ocean conditions

HABITAT REQUIREMENTS

- use low-gradient tributary streams for spawning and rearing
- need clean spawning gravel 1-3" in size
- rear in lakes and ponds, if available
- prefer to overwinter in off-channel pools, ponds, and beaver ponds
- prefer complex, shaded stream channels containing small and large woody debris and tree-lined banks

IT'S A FACT

Coho, called *Silvers* in Alaska, can lay 2,500 eggs, with possibly only five surviving to adulthood.

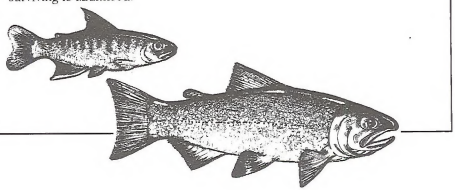


Table Twelve

DISTRICT/WATERSHED	STREAM HABITAT (MILES)^ TOTAL	STREAM HABITAT (MILES)^ COMPLETED	RIPARIAN HABITAT (ACRES) TOTAL	RIPARIAN HABITAT (ACRES) COMPLETED
Spokane	8	0	660	660
Salem				
Nehalem	10	0	354	0
Tillamook Bay	34	4	1,264	0
Nestucca	86	37	3,091	1,536
Siletz	19	15	1,358	0
Alsea	115	38	5,953	660
Eugene				
Siuslaw	197	54	5,910	1,740
Smith	10	0	?	?
Roseburg				
Umpqua	837	250	18,000	0
Medford				
Rogue	358	85	17,408	2,549
S. Umpqua	83	60	4,032	1,455
Illinois	67	67	3,258	3,258
Coos Bay				
Chetco	7	0	61	0
Coquille	68	45	2,070	1,818
Coos	65	65	746	0
Umpqua	96	20	2,904	1,156
New River/Floras Cr	2	2	29	0
Pistol	2	0	91	0
Sixes	3	0	93	0
Other misc. streams	5	0	121	0
TOTAL (OR/WA)	2,072	742	67,403	14,832
Ukiah				
Klamath	48	8	5,430	600
Sacramento	47	5	3,460	400
Mattole	87	10	6,190	750
Eel	41	8	3,020	590
TOTAL (CA)	223	31	18,100	2,340
GRAND TOTAL	2,295	773	85,503	17,172

a- Represents a detailed inventory.

Stream and riparian habitat inventories and evaluation.

and standards are met. When results of monitoring show that objectives are not being met, the information will be used to modify management activities and standards.

Techniques used in monitoring can include GIS, remote sensing, seasonal fish population monitoring in cooperation with state fish and wildlife departments, infrared photography, satellite imagery, aerial videography, and stream and riparian inventories. The Ukiah District Mattole River Estuary Monitoring Project is an excellent proposal to establish a long-term monitoring program to measure the health and changes in a coastal

estuary, since estuaries are a key habitat component for all anadromous salmonids, which are at risk throughout the coastal region. However, this project presently is unfunded.

KEY WATERSHEDS

Key watersheds (Table 14) are those watersheds or streams identified in FEMAT report (1993) and BLM districts that (1) contain habitat for potentially threatened species or stocks of anadromous salmonids or other potentially threatened fish; or (2) have high quality water and intact habitat; or (3) have high restoration potential; or (4) contain a high percentage of federal land and have one or more of items 1-3. Of the 68 key watersheds listed in *Table 14*, 22 are key areas identified in FEMAT report (1993), and ten overlap and/or contain lands within the key watershed network of Johnson et al. (1991). Included within BLM key areas are about 70 stocks of anadromous salmonids that are determined to be at risk or of special concern.

Because key watersheds are important for maintaining and restoring the best remaining habitats, they will be given special consideration. All key watersheds require watershed analysis prior to further resource management activity. All BLM key watersheds will receive priority in any watershed restoration program.

WATERSHED RESTORATION

The completion of the anadromous fish improvements outlined in *Table 15* would improve habitat conditions on 34,280 acres of riparian habitat, 510 miles of stream, 300 acres of uplands, and 9,000 miles of road on BLM lands in 24 coastal watersheds. Approximately 65 culverts would be upgraded to provide better fish passage on streams currently used by anadromous fish. All projects outlined would contribute to the recovery of coastal anadromous fish. In conjunction with restoration projects, annual maintenance of instream structure, riparian rehabilitation, fences, road stabilization, fish passage, and upland rehabilitation will be accomplished to maintain project and cost effectiveness of completed work. Estimates for removal and stabilization of roads were determined by annually decommissioning 50 miles of road for each district in Oregon and California at a average cost of $6,750/mile and upgrading 100 miles of road for each district at a average cost of $3,000/mile (FEMAT

Table Thirteen

DISTRICT	TYPE AND NUMBER OF ANALYSES		
	LONG-TERM[a]	PROJECT[b]	VALIDATION/EFFECTIVENESS[c]
Salem	17	2	H,J,S,A,R,T
Eugene	5	13	H,A,R,T
Roseburg	13	1	H,J,S,A,R,T
Medford	5	15	H,J,A,R,T
Coos Bay	3	20	H,J,S,A,R,T
Ukiah	2	4	H,J
TOTAL	45	55	

a- Long-term monitoring of a subbasin containing at least 50% BLM lands. b- Monitoring of fish restoration projects. c- Monitoring includes analysis of changes in habitat(H), summer juveniles(J), smolts(S), adults(A), riparian(R), and treatment structures(T).

Basin/subbasin monitoring/analysis.

Table Fourteen

DISTRICT/WATERSHED	STREAM	WATERSHED PRIORITY				STOCKS	
		USFS[a]	AFS[a]	FEMAT[c]	BLM[a]	RISK[d]	ISSUE[e]
Salem/Tillamook B.	L Kilchis R,Clear Cr		X	X	1	2,3,4,5,7	1,2,3
Salem/Tillamook B.	LNF Wilson		X	X	1	2,3,4,5,7	1,2,3
Salem/Nestucca	Nestucca R	S	X	X	1	2,3,4,5,7	1,2,3
Salem/Trask	MF Trask R/Elkhorn Cr		X	X	1	2,4,5,7	2,3
Salem/Siletz	NF Siletz R/Warnick Cr		X	X	1	2,4,5,6,7	1,2,3
Salem/Alsea	Tobe Cr			X	1	4,5,7	1,2,3
Salem/Alsea	Lobster Cr			X	1	2,4,5,7	2,3
Salem/Alsea	Drift Cr	S		X	1	4,7	2,3
Salem/Siletz	Drift Cr	S		X	1	3	2,3
Roseburg/Smith	Upper Smith R			X	1	4,5,7	3
Roseburg/Umpqua	S Umpqua R	U	X	X	1	2,4,7	2,3,4
Roseburg/Umpqua/Steamboat	Canton Pass Cks	U	X	X	1	4,7	1,2,3
Coos Bay/Umpqua	Paradise Cr			X	1	3,4,7	2,3
Roseburg/Umpqua/Cow	Middle Cr			X	1	2,3,7	2,3
Medford/Umpqua/Cow	WF Cow Cr			X	1	4,7	2,3
Coos Bay/Coos	Tioga Cr		X	X	1	4,5,7	3
Coos Bay/Smith	Big,Johnson,Spenser, and Vincent Cks				2	4,5,7	2,3
Coos Bay/Smith	WF Smith R				2	4,5,7	2,3
Coos Bay/Coquille	Upper NF Coquille R			X	1	4,7	3
Coos Bay/EF Coquille	Cherry Cr		X	X	1	4,7	1,3,4
Coos Bay/Coquille	SF Coquille R	Si	X	X	1	4,7	3
Coos Bay/Chetco	NF Chetco R	Si	X	X	1	1,4,5,7	2,3
Medford/Rogue/Silver	NF Silver Cr	Si	X	X	1	1,4,5,7	3,4
Medford/Rogue	Elk Cr	R	X	X	1	4,6	2,3,4
Medford/Rogue/L.Butte	Little Butte Cr		X	X	1	4,6	2,3,4
Medford/Klamath	Jenny Cr		X	X	1	8,9	2,3,4
Ukiah/Mattole	Honeydew, Bear Cks			X	1	4	2,3,4
Ukiah/Klamath/Trinity	Trinity R,Grass Valley and Indian Cks				2	2,3,4,6	3,4
Ukiah/Eel	Rock Cr				2	6,7	3,4
Ukiah/Klamath	Upper Klamath R, Shasta Cr				2	1	3,4
Medford/Rogue/Applegate	Pipe,Star Gulch,Powell, and Nine Mile Cks				2	4,6	2,3,4
Medford/Rogue/Illinois	NF Deer Cr				2	4,5,7	3
Medford/Rogue	Mule Cr				2	4,5,7	2,3
Medford/Rogue/Evans Cr	West Evans Cr				2	4,6	3,4
Medford/Rogue/Illinois	Upper Illinois R				2	4,5	2,4
Ukiah/Eel	SF Eel R				2	4,6,7	3,4
Eugene/Siuslaw/Lake	Upper Lake,Congdon,Fish, and Nelson Cks				2	1,4,5,7	2,3
Eugene/Siuslaw/Lake	Greenleaf,Whittaker Cks		X		2	1,4,5,7	2,3

a- USFS key watersheds (FEMAT 1993) S=Siuslaw, U=Umpqua, Si=Siskiyou, R=Rogue River National Forests. b- AFS (Oregon Chapter) list of candidate watersheds for reserves and restoration. c- Tier 1 key watersheds identified in FEMAT, 1993. d- 1=highest priority (identified in FEMAT (1993), 2=lower priority, restoration watershed. e- Chf=1,Chs=2,Cu=3,Co=4,Stw=5,Sts=6,Ct=7,Jenny Creek sucker=8,Redband=9. f- 1=intact, 2=high value, 3=restorable, 4=severe problems.

Key watersheds.

1993). Watershed and riparian restoration costs were estimated at $500/acre. For channel restoration projects; $40,000/mile was used for Salem, Medford and Ukiah Districts; $30,000/mile for the Roseburg District; and $20,000/mile for Eugene and Coos Bay Districts.

Land Tenure Adjustments

Because of BLM's fragmented pattern of lands, proposed management that benefits salmonids will be difficult in some watersheds unless additional stream and riparian habitats are secured to block up ownership. In coastal watersheds, BLM has identified opportunities to acquire habitat through conservation easement, rights of way, exchange and purchase that are important for better management *(Table 16)*. Securing about 247 miles of stream and 129,100 acres of riparian habitat and associated uplands in these watersheds would block up important anadromous fish habitat,

Table Fifteen

DISTRICT/WATERSHED	RIPARIAN (ACRES)	CHANNEL (MILES	FISH PASSAGE	WATERSHED*
Spokane	100	0	0	300 acres
Salem				1,500 miles
Tillamook Bay	1,078	4	0	
Nestucca	1,630	5	0	
Siletz	1,144	4	0	
Yaquina	73	1	0	
Alsea	3,727	8	0	
Eugene				1,500 miles
Siuslaw	5,319	184	0	
Roseburg				1,500 miles
Umpqua	7,018	65	20	
Medford				1,500 miles
Rogue	1,200	10	20	
S. Umpqua	300	5	16	
Illinois	200	2	5	
Coos Bay				1,500 miles
Chetco	61	7	1	
Coquille	2,070	68	0	
Coos	746	25	0	
Umpqua	2,904	96	0	
TOTAL (OR/WA)	27,570	484	62	7,500 MILES
Ukiah				1,500 miles
Klamath	1,800	20		
Mattole	3,100	3		
Sacramento	1,400	1		
Eel	410	2	3	
TOTAL (CA)	6,710	26	3	1,500 MILES
GRAND TOTAL	34,280	510	65	9,000 MILES

a- Upland acres or miles of road.

Watershed restoration opportunities.

lead to improved land management and allow better habitat restoration throughout the drainage. Retention of isolated tracts of public land may be necessary to anchor habitat conditions or restoration efforts if no or little other federal land occurs in the watershed. BLM will work cooperatively with watershed landowners to develop effective management strategies. Willingness of landowners to provide easement, exchange or sell, will be a primary consideration in setting priorities for securing land. Prior to initiation of any easement, exchange, or sale a detailed plan will be submitted for management approval. For consistency, $50/acre was used to determine costs for securing land and $3,000/wm.

Table Sixteen

DISTRICT/WATERSHED	HABITAT ACQUISITION NEEDS	
	STREAM MILES	WATERSHED AREAS
Spokane (Skagit)	2.0	600
Salem		
Tillamook Bay	3.5	2,240
Nestucca	4.3	2,750
Siletz	3.2	2,050
Yaquina	1.0	640
Alsea	7.5	4,800
Eugene		
Siuslaw	48.0	31,140
Roseburg		
Umpqua	51.0	8,320
Medford		
Rogue	12.5	17,560
S. Umpqua	31.0	33,780
Illinois	8.5	6,620
Coos Bay		
Chetco	10.0	1,000
Coquille	10.0	300
Coos	10.0	300
Umpqua	20.0	600
TOTAL (OR/WA)	222.5	112,700
Ukiah		
Klamath	12.0	6,500
Mattole	6.0	6,700
Eel	2.0	1,100
Sacramento	4.0	2,100
TOTAL (CA)	24.0	16,400
GRAND TOTAL	246.5	129,100

Potential land tenure adjustments.

Columbia

INITIATIVE FOR THE COLUMBIA AND SNAKE RIVER WATERSHEDS

INITIATIVE PLANNING TEAM

Neil Armantrout, Eugene District

Frank Bird, Challis Resource Area

Robert House, Anadromous Fish Coordinator

Craig Johnson, Cottonwood Resource Area

Joe Kelly, Wenatchee Resource Area

Mark Lacey, Baker City Resource Area

Bob Ruediger, Salem District

Allan Thomas, Fisheries and Wildlife, Idaho

Jude Trapani, Lemhi Resource Area

Dave Young, Central Oregon Resource Area

Ron Wiley, Fisheries, Oregon

JANUARY 1995 • PREPARED ORIGINALLY FOR THE 1991 SALMON SUMMIT AND UPDATED FOR THE NORTHWEST POWER PLANNING COUNCIL

Background

In March 1990, the Shoshone-Bannock Tribes of Idaho petitioned the NMFS for immediate listing of the Snake River sockeye salmon. In May, Oregon Trout filed petitions requesting threatened status for four stocks of Columbia River salmon; the lower river coho, and the spring, summer, and fall Snake River chinook.

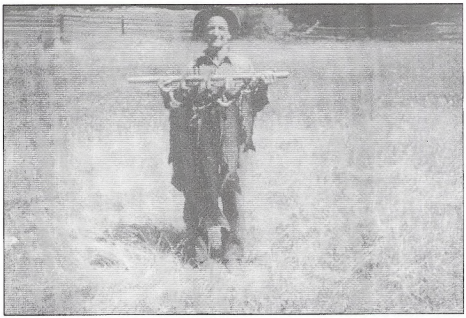
The *Salmon Summit*, convened in October 1990 by Senator Mark Hatfield and the governors of Idaho, Montana, Oregon, and Washington, laid important groundwork for a regional recovery plan. The Summit, made up of 30 user, policy, and interest groups (including the BLM and the USFS), affiliated with the Columbia Basin's waterways, came up with critical short-term measures, implemented in 1991, to stem further declines of Snake River sockeye and chinook salmon.

The Summit concluded that salmon runs in the Columbia and Snake Rivers had declined to about ten percent of historic levels with trends continuing downward. Causes for the decline were numerous: losses at hydroelectric dams from power turbines and migration problems; long-term habitat loss from past improper land management practices; genetic weakening from hatcheries; overharvest by commercial, sport, and tribal groups; losses from unscreened irrigation ditches; and increased river and estuary predation.

After the Summit concluded in March 1991, the governors asked the Northwest Power Planning Council (established under the authority of the Northwest Power Act, with members appointed by the Northwest governors and hereafter referred to as the Council) to expand its focus to address all activities that impact salmon, not just the hydroelectric system. The Council, initiated a process to amend its fish and wildlife program. The Council's aim is to make future Endangered Species Act petitions unnecessary and ultimately to have healthy and harvestable populations of anadromous salmonids produced in the Columbia Basin.

In April 1991, BLM provided the Council a Salmon Summit Plan, *Anadromous Fish Habitat Management Plan for the Columbia and Snake River Basins*, which listed habitat commitments for anadromous fish. An update of the 1991 plan was needed to re-define and develop management strategies based on new and more accurate information and the overall goals established and adopted (September 1992) by the Council's *Phase Three, Columbia Basin Fish and Wildlife Program Strategies for Salmon (Volume II)*.

In December 1991, the NMFS declared the Snake River sockeye salmon as endangered and in May 1992, the spring, summer, and fall chinook salmon stocks in the Snake River as threatened.



Limits of spring/summer chinook in the upper Salmon River (Idaho) once were common up to the early 1960s, but now the Snake River fish are listed as threatened pursuant to the Endangered Species Act.

In February 1993, BLM commitments were incorporated by the Council in its strategy plan. These commitments included: inventory and prioritize salmon and steelhead production areas; improve water quality and quantity; develop, review, and revise grazing, mining, and land use plans to include riparian, fish, and water quality objectives; ensure adequate screening of irrigation ditches; and identify and pursue land exchange/acquisition opportunities to promote management of key riparian habitat in anadromous fish production areas. At that time, BLMs goal was to complete these commitments by 1997. However, with new Section 7 consultation commitments and guidelines and priorities for screening irrigation ditches, habitat improvement and screening commitments will not be completed by FY1997.

Since release of the Council's strategic plan, BLM, in partnership with other agencies including the USFS, has initiated the long-term management strategies outlined in the SEIS for FEMAT and the interim measures in PACFISH. The Eastside Ecosystem Management Project and the resulting EISs will address a long-term implementation strategy for eastern Oregon and Washington and Idaho. New strategies will be ecosystem based and go beyond a "fish/water" emphasis to address terrestrial resources as well. Therefore, they complement and enhance the goals established by the Council's strategic plan.

The interim PACFISH strategy provides management direction that would supplement Land Use Plans. The strategy includes new riparian goals, interim regional Riparian Management Objectives (RMOs), interim widths for RHCAs, standards and guidelines for application to all kinds of projects and activities within RHCAs, identification of key watersheds, and provides for Watershed Analysis. These regional RMOs and interim RHCA widths will be further refined at a watershed level through watershed analyses. Also the RMOs, which address pool frequency, water temperature, large woody debris, width/depth ratio, bank stability and lower bank angle, are the equivalent of the Council's habitat performance standards. The specific RMOs may not be met for many years due to the slow response of the stream features to improved management. However, together these strategies will prevent further degradation and begin the restoration of riparian and aquatic ecosystems in watersheds of the Columbia Basin containing anadromous fish. Information included in this report, collected since 1988, reflects a greater emphasis on watershed management. Planned accomplishments include continuation of ESA Section 7 consultation and implementing management strategies (including interim PACFISH requirements) outlined in Idaho, Oregon and Washington over the next eight years (to the year

In Idaho, 65% of the riparian habitat and stream channels on BLM lands are presently in minimal or fair condition.

Although BLM administers only 26 miles of stream in Washington, those streams contain 39 stocks of salmon and steelhead that are at risk of extinction.

2000) needed to meet the Council's goals for changes in land and water management, water diversion screening, watershed/riparian management, habitat improvement, inventorying and monitoring, and habitat and water rights acquisitions. Although this plan is a multi-year strategy, priority will be given to short-term commitments, such as inventorying, monitoring and restoring occupied habitat, screening irrigation ditches, and ongoing Section 7 consultation.

Full benefits from watershed and habitat improvements identified in this report can only be realized if salmonid survival outside of tributary production can also be measurably improved. However, better habitat conditions on BLM lands would increase salmon production per returning fish during the current period of low spawner returns.

BLM administers about 966 miles of streams in 52 subbasins that are currently used for spawning and/or rearing anadromous salmonids in the Willamette, Columbia, and Snake River Basins *(Table 17)*. Of the 966 miles of stream used by anadromous salmonids, chinook salmon are found in about 575 miles, coho salmon in 45 miles, sockeye salmon in 175 miles, and steelhead in 966 miles. BLM also manages another 981 miles of streams located below and above major dams with and without fish passage in the Willamette, Columbia, and Snake Rivers that currently do not have fish runs because they are either dewatered or fish have no access. Also, 3,094 miles of streams and more than 3,427,000 acres in 52 subbasins partially managed by BLM in the Willamette, Columbia, and Snake River Basins in Oregon, Idaho, and Washington contribute to the quality of habitat in fish producing streams. In the 52 subbasins with BLM managed lands, 18 drainages contain three listed species and another 39 drainages contain 42 anadromous salmonid stocks currently at risk of extinction or of special concern *(Table 18)*. Also, numerous subbasins containing BLM lands support anadromous and resident populations of sensitive salmonids, including wild steelhead trout, bull trout, inland Columbia Basin redband trout, and the westslope cutthroat trout.

In the Columbia Basin, the current condition of riparian and stream habitat on BLM lands varies

Table Seventeen

STATE/BASIN	BLM STREAM MILES[a] EXISTING	BLM STREAM MILES[a] HISTORICAL	BLM ACRES[b] INFLUENCING	BLM ACRES[b] (000's)
Oregon/Washington				
Willamette	184	147	475	399
Columbia	398	401	800	1,285
Snake	70	29	230	407
TOTAL	652	577	1,505	2,091
Idaho				
Snake	70	220	407	585
Salmon	244	184	1,182	751
GRAND TOTAL	966	981	3,094	3,427

a- Miles of BLM streams currently or historically occupied and influencing conditions in streams used by anadromous salmonid stocks either listed and/or at risk (identified by Nehlsen et al 1991, Pacific Salmon at the Crossroads: Stocks at Risk from California, Oregon, Idaho, and Washington, Fisheries:16(2). b- Acres of BLM land in subbasins containing anadromous salmonid stocks either listed and/or at risk.

Anadromous salmonid habitat on BLM lands in Willamette, Columbia, and Snake River Basins (stocks listed and/or at risk).

Table Eighteen

STATE/BASIN	TOTAL SUBBASINS[a]	SALMONID STOCKS LISTED OR AT RISK[b]: # OF SUBBASINS	# WITH LISTED STOCKS	# OF STOCKS AT RISK
Oregon/Washington				
Willamette	14	5	-	4
Columbia	22	19	3	32
Snake	3	3	3	3
TOTAL	39	27	6	39
Idaho				
Snake	13	12	12	3
GRAND TOTAL	52	39	18	42

a- Number of identified Council's subbasins in the Willamette, Columbia, and Snake River Basins containing lands managed by BLM. b- Number of subbasins and anadromous salmonid stocks containing BLM lands which are either listed and/or at risk.

Subbasins containing BLM lands and used by anadromous salmonid stocks either listed and/or at risk.

Table Nineteen

STATE/BASIN	HABITAT CONDITION: RIPARIAN (ACRES)[a] MIN.	FAIR	OPTIM.	STREAM CHANNEL (MILES)[b] MIN.	FAIR	OPTIM.
Oregon/Washington						
Willamette	5,596	5,861	1,867	81	88	15
Columbia	60,320	13,080	7,320	207	74	137
Snake	474	1,127	1,364	16	38	45
Idaho						
Snake	47	819	585	30	154	106
Salmon	505	2,467	1,444	71	228	157
GRAND TOTAL	66,942	23,354	12,580	405	582	460

a- The estimated or measured condition of riparian zone is based on either the composition and condition of existing vegetation compared to the potential site specific native plant composition and condition. For this table, minimal = early seral and poor stream banks, fair = mid-seral and fair stream banks, and optimal = late seral or close to potential natural community and good stream banks. b- Stream channel miles are those presently and/or historically containing anadromous salmonids. Stream condition ratings are based on inventory data, riparian conditions, or best available credible information

Condition of riparian and aquatic habitat in watersheds containing anadromous salmonids.

considerably between states and major river basins *(Table 19)*. Much of the varied conditions is the result of different hydrologic regimes, ecoregions, geology, stream size, and land management patterns. In Oregon, about 42 percent of riparian and 44 percent of stream habitat was in minimal condition in the Willamette Basin. In the Columbia and Snake River Basins in eastern Oregon and Washington, 73 percent of the riparian habitat and 43 percent of the streams were in minimal condition. In Idaho, only 9 percent of riparian habitat and 14 percent of stream habitat was in minimal condition.

BLM and USFS, along with other public and private agencies, organizations, and the academic community, can play an important role in meeting the recovery goals of the Council. BLM and the USFS manage about 60 percent of the existing and potential salmonid habitat in the Columbia and Snake River basins. BLM manages significant salmonid habitat in the mainstem and tributaries of the Willamette, Sandy, Grande Ronde, Deschutes, John Day, Walla Walla, Snake, Salmon, and Clearwater River subbasins.

Past Rehabilitation Efforts

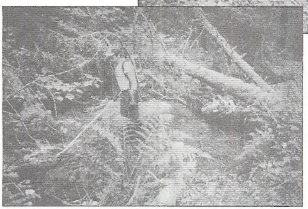
Past accomplishments to restore degraded habitat have been relatively small in scope, and much more remains to be completed. Future accomplishments will integrate actions on a watershed basis. Updating of management plans, stream and riparian inventories, rehabilitation of streams, riparian habitat, roads, and uplands, maintenance of completed projects, monitoring/evaluation, and potential land tenure adjustments will be coordinated and prioritized within watershed boundaries.

In Eastern Oregon from 1976 to 1991, BLM invested about $575,000, including $130,000 from the Bonneville Power Administration and another nearly $105,000 from other sources, to improve wild steelhead production in the John Day subbasin.

Also, efforts to ensure land use plans in Oregon and Washington currently contain adequate stream and riparian protection objectives and land use allocations are mostly complete.

In Idaho, BLM also has an active stream habitat improvement program. For example, in the last ten years the Coeur d'Alene District has installed more than 2,000 structures made of large rocks and woody debris in five miles of the American River. Past work also emphasized habitat inventories, bank stabilization, determining minimum flow requirements, fencing to control livestock access in riparian areas, and water quality/quantity levels for streams threatened by small hydro projects.

In the Columbia Basin, most anadromous streams flow through narrow riparian stringers, and only 12% of these areas are in optimal condition.



Although most BLM administered streams in the Columbia Basin flow through range areas, some are located in forested regions and are generally in optimum condition.

ACCOMPLISHMENTS SINCE 1992

The commitments originating out of Salmon Summit dramatically increased base funding levels starting in FY1992. Staffing also increased to meet the new goals and objectives. Most accomplishments since 1992 fall into four main categories: stream and riparian inventory, monitoring, grazing plan revisions and watershed and stream restoration. Since 1992, 1,683 miles of stream and 1,818 acres of riparian habitat have been inventoried; 46 streams (including 542 sites) have been established for stream, riparian and fish population monitoring; 638 grazing allotments have been revised; and 68 miles of stream have been restored:

	INVENTORY	
YEAR	MILES	ACRES
1992	1,000	
1993	350	
1994	333	1,818
TOTAL	1,683	1,818

	MONITORING	
YEAR	STREAMS	SITES
1992	46	
1993		210
1994		332
TOTAL	46	542

Steelhead

(Oncorhynchus mykiss)

DISTRIBUTION

Kenai Peninsula, Alaska, to northern Baja Peninsula, Mexico

STOCKS

California - 17 (10 at high risk); *Oregon* - 27 (one at high risk); *Washington* - 68 (four at high risk)

WILD ADULT STATUS

1930s - 100,000 adults in nine basins north of the Coquille River, Oregon
1980s - 50,000 adults in same nine basins, declining trend

LIFE HISTORY

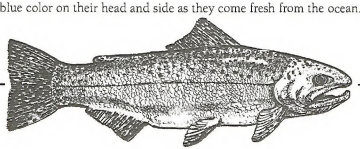
- life cycle varies from 1-4 years in both freshwater and saltwater, however most fish have a four year cycle (two fresh and two saltwater) two distinct runs: winter run fish return to freshwater from November through March; summer run fish return to freshwater in late spring through summer: and both spawn between December and June
- most adults die after spawning, however some 20% and usually females) survive to spawn more than once
- adults can reach over two feet in length and weigh over 30 pounds, but most average 6 to 8 pounds
- females lay around 4,000 eggs in gravel, of which about 10% emerge as juveniles
- about 50% of the young emerging from the gravel survive to enter the ocean and 10% of those survive to become adults

HABITAT REQUIREMENTS

- adults use low to high gradient tributaries and small to medium sized tributaries and rivers to spawn and rear
- need one-half to 4" gravel for spawning
- young need complex instream habitat, consisting of a mixture of mainstem and off-channel pools and riffles containing complexes of wood and cobble/boulder for cover
- adult summer fish need cool water during the summer and deep holding pools

IT'S A FACT

Steelhead, the migratory form of rainbow trout, received their name from the silver-blue color on their head and side as they come fresh from the ocean.



YEAR	GRAZING PLAN REVISIONS
1992	150
1993	221
1994	267
TOTAL	638

YEAR	RESTORATION MILES
1992	10
1993	9
1994	49
TOTAL	68

More specifically, the following work was accomplished from 1992 to 1994:

1992

In Oregon, stream inventory, monitoring and restoration work was conducted in tributaries of the Willamette, Columbia, and Snake Rivers. In the Salem, Prineville, Vale, and Spokane Districts, $305,500 was spend on work in eight subbasins including; inventorying 799 miles of stream and riparian habitat, restoring habitat conditions on two miles of stream, monitoring for water quality on one stream, and completing four habitat plans.

In Idaho, work was completed in tributaries of the Upper and Lower Salmon and Clearwater Rivers. The Coeur d'Alene and Salmon Districts worked in three subbasins, inventorying 201 miles of stream and riparian habitat, restoring habitat conditions on 7.6 miles of stream, monitoring for water quality on 45 streams, and completing two habitat plans, totaling $532,300.

1993

Inventory

BLM accelerated its inventory of anadromous fish habitats in the Willamette, upper and lower Columbia and Snake River Basins in 1993. About 100 miles of stream and riparian habitat s upporting anadromous fish were extensively inventoried in the lower Snake and Salmon Rivers in Idaho and John Day, Deschutes, Sandy, and Willamette River drainages in Oregon. In addition, broad-scale infrared photography was conducted along 250 miles of streams in Idaho.

Monitoring

To determine the effectiveness of anadromous fish recovery efforts, changes in habitat conditions and water quality and quantity were initially evaluated at more than 210 monitoring sites. Monitoring included measurements of water temperature, stream habitat and riparian vegetative conditions, stream discharge, livestock use, and fish population and salmon and steelhead redd counts to estimate trends on BLM lands. Redd counts were initiated on 32 and 100 miles of stream in Oregon and Idaho, respectively. New monitoring efforts, concentrated in the John Day and Deschutes River drainages, will enable BLM to change current prescriptions if we are not progressing toward objectives established in the FEMAT and PACFISH strategies. In Idaho, BLM is developing and implementing "best management practices" (BMPs) to improve water quality. BMPs for agriculture have been reviewed and updated in Idaho.

Grazing Allotment Changes

BLM updated management on 221 grazing allotments, incorporating management changes in leases and permits necessary to improve stream habitat for listed salmon. An additional 75 allotments are being evaluated in areas outside critical habitat for other anadromous fish. Evaluations of all grazing allotments will be completed by 1996.

Irrigation Diversion Screening

BLM identified 14 diversions needing new or replacement screens in areas where the agency has some management responsibilities, such as rights-of-way. In addition, 83 fish passage problems will have been identified for correction. BLM continues working with the Interagency Fish Screen Technical Working Group to design, build and install needed screens. Presently, the Idaho Fish Screen Shop has established the highest priority to screening needs in the Lemhi Model Watershed Project, delaying screen installation on BLM lands in Idaho.

Land Exchanges

In Oregon, BLM and USFS are proposing to exchange land with private landholders on numerous land parcels in northeastern Oregon and southwestern Washington. A total of 27.6 miles of potential chinook spawning and rearing habitat, 9.7 miles of perennial and 19.1 miles of intermittent streams where water quality could, potentially, be improved under Federal management authorities will be transferred to federal ownership. These lands are in the lower and upper Grande Ronde, Wallowa, Imnaha, and lower Snake/Asotin hydrologic units. In Idaho, BLM obtained management of land through exchanges on the Salmon River and Hard, Hazard and Captain John Creeks.

Restoration

In Oregon, improved watershed management, coupled with stream restoration projects on 34 miles of stream, were initiated in fiscal year 1993. Most of the work was conducted in watersheds of the John Day Basin, with lesser efforts in the Deschutes, Sandy and Willamette River Basins. Completed projects included three miles riparian planting and streambank erosion control; 21 miles fence construction and maintenance; six spring developments (constructed to relocate livestock watering out of riparian areas); nine miles of channel restructuring and secondary channel development; and 4,200 acres of watershed vegetation control. In Idaho, BLM's emphasis on stream restoration centered on improved management to allow natural stream recovery. Individual projects will be planned in areas where natural recovery is too slow or not satisfactory. BLM continues cooperating and assisting in several non-federal basin planning efforts in Idaho and Oregon.

1994

Inventory

In 1994, BLM continued its accelerated inventory and monitoring of anadromous fish habitats in the Snake, upper and lower Columbia and Willamette River Basins. Inventory and monitoring again included measurements of water temperature, stream habitat and riparian vegetative conditions, stream discharge, livestock use, and juvenile and adult fish distributions including salmon and steelhead redd counts. In Oregon, 16 miles of stream in the Grande Ronde River were inventoried for aquatic habitat conditions. In the John Day River, 25 miles of stream were inventoried and spawning ground counts for chinook salmon and steelhead were conducted on 123 miles (90 of them by video) of stream. In the Willamette and lower Columbia River Basins, another 62 miles of stream and 1,818 acres of riparian habitat were inventoried for habitat conditions. In Washington, 27 miles of riparian habitat was inventoried in six watersheds in the mid and upper Columbia Basin. In Idaho, 182 miles of private and BLM streams were inventoried in the Lemhi, Pahsimeroi and East Fork Salmon Rivers of the upper Salmon River in conjunction with the Lemhi Model Watershed Project. Also in the upper Salmon River, another 55 streams were inventoried to determine fish distribution. In the lower Salmon and Clearwater Rivers, 12 miles of stream were inventoried for habitat conditions, and 25 miles for riparian condition (low level infrared photography).

Monitoring

The interim PACFISH strategy and its Biological Opinion under Section 7 consultation, requires that BLM and the Forest Service develop coordinated monitoring efforts for their lands in watersheds within the Columbia Basin. The PACFISH strategy requires implementation monitoring starting in FY1995 and effectiveness monitoring starting in FY1996. These coordinated efforts will ensure consistent monitoring and inventory elements and standards and protocols.

In Oregon, BLM continued water quality monitoring on anadromous fish streams in the John Day and Deschutes River drainages. Monitoring included measurements of water temperature and quality at 80 stations. Also, to protect water quality, BLM continued to evaluate and revise grazing leases and permits. To fulfill an informal consultation agreement relating to all activities with listed species or designated critical habitat, three extensive monitoring reports, covering 11 Section 7 Consultation Biological Evaluations (BE) in Idaho, were prepared and forwarded to NMFS. Also in Idaho, BLM in Section 7 Consultation with the NMFS, implemented completed BMPs to improve water quality in streams that affect T&E salmon or

their critical habitat. The Cottonwood RA has increased road use monitoring to evaluate road BMPs and complete a draft travel plan. Also in Cottonwood, in relation to restoration of ten miles of anadromous fish habitat, a contract to evaluate ground water and surface flow relationships, was completed. Finally, 75 stations in the lower Salmon and Clearwater Rivers and 102 sites and 100 photo points in the upper Salmon River were again monitored for changes in riparian and aquatic habitats.

Grazing Allotment Changes

In Oregon, evaluations on 25 allotments in the Deschutes River Basin and 21 allotments in the John Day River Basin were completed. In Washington, evaluations on 87 allotments in six watersheds, totaling 44,535 acres were completed. In the Willamette Basin, two watershed analyses were completed. In Idaho, grazing allotments on San Felipe, Herd, Lake, Warm Springs and Road Creek (187,000 acres) were subject to extensive management changes, including revamping existing Allotment Management Plans (AMPs) to conform to consultation requirements. Another 54 allotments affecting salmon were modified and another 80 plus allotments received increased monitoring and evaluation, for grazing in areas inside and outside critical habitat for listed species.

Restoration

In Oregon, restoration work in the Willamette River Basin included construction of 40 instream structures on one mile of Eagle Creek on the Clackamas River and rehabilitation of 25 acres of riparian habitat along five miles in three streams. In the John Day River Basin, two stream restoration projects in Bridge Creek and the South Fork John Day River should improve anadromous fish habitat conditions along 48 miles of stream. In the Deschutes and John Day River Basins, spring developments (constructed to relocate livestock watering out of riparian areas), creation of four new riparian pastures, construction of two allotment boundary fences and burning and reseeding of 200 acres of rangeland should all contribute to better watershed and riparian conditions on rangelands affecting anadromous fish.

In Idaho, the Cottonwood RA fenced off and started rehabilitation on 16 acres of land adjacent to the Salmon River, completed a 2.5 mile road improvement project to reduce erosion in the Little Salmon River drainage and partially funded and assisted on a watershed plan for Trail Creek. In the Challis RA, drift fences and/or exclosures were surveyed for construction in FY1995. Stream restoration emphasis centered on improved management to allow natural stream recovery, with individual projects planned in areas where natural recovery is too slow or not satisfactory.

Management Implementation

The following sections describe management actions needed to comply with the goals and objectives developed by the Salmon Summit, the Council and the USFS/BLM PACFISH strategy. Estimates of cost and program accomplishments were provided by resource areas and district personnel in Oregon, Washington, and Idaho and are totals for the period ending in year 2000. Estimates are for additional work that cannot be accomplished with present resources (dollars and people). Short-term priority will be given to management actions that affect listed salmon stocks, with long-term priority given to stocks not currently listed but at risk or of special concern.

WATERSHED PLANS AND CONSULTATION

Efforts to complete watershed plans will vary depending on the extent of BLM ownership and the number of

management actions needing review or updating within the subbasin. BLM has completed 17 BE's in Oregon, Washington and Idaho to comply with Section 7 consultation, which will serve as the information base to complete Watershed Analyses for these areas. Two Land Use Plans in Idaho are near completion *(Table 20)*.

One of the most cost-effective ways of improving or maintaining the productivity of anadromous streams is timely and adequate input of fisheries values and concerns into land use activity plans. Current management actions will be reviewed and revised to include measures that will improve degraded habitat and protect existing habitat in good condition.

The highest priority actions would be:

- *Grazing* - developing riparian management strategies and administration of grazing leases/permits.
- *Lands/ROW* - adequate stipulations and enforcement for roads, power lines, dams, small hydro projects; acquisition of water rights; and review of diversion screens.
- *Timber* - adequate timber sale stipulations and enforcement for roads and logging systems.
- *Recreation* - adequate stipulations and enforcement in wild and scenic river plans and boating.
- *Mining* - adequate stipulations and administration of mining plan or operations; designation of new areas of critical environmental concern (ACECs).
- *Hazardous Waste* - safe location and adequate containment of hazardous chemicals that may affect water quality.

In all cases, teams of fisheries and wildlife biologists, range conservationists, surface protection specialists, foresters, soil scientists, recreation planners, and managers, will review management actions to ensure anadromous fish resources are considered in all strategies. Presently, the lack of automated data analysis will make decision-making processes lengthy and difficult.

INVENTORY AND EVALUATION

Although BLM has completed detailed habitat inventories on approximately 683 miles of stream, another 2,158 miles of stream and 125,814 acres of riparian habitat need to be inventoried or reinventoried in the Willamette, Columbia, and Snake River Basins *(Table 21)*. Little of this data has been put into a digital format for rapid analysis and processing.

Table Twenty

	NUMBER OF PLANS		
STATE/BASIN	PROPOSED	UPDATED/ AMENDED	DEVELOPED/ ONGOING
Oregon/Washington			
Willamette	23		1
Columbia	42		
Snake	4		
Sect.7 Consult.			6
TOTAL	69		7
Idaho			
Snake	37	1	3
Sect.7 Consult.			11
Land Use Plans		2	
TOTAL	37	3	14
GRAND TOTAL	106	3	21

Integrated Watershed and Land Use plans and Section 7 consultation.

Table Twenty-One

STATE/BASIN	STREAM HABITAT (MILES) TOTAL	STREAM HABITAT (MILES) COMPLETED	RIPARIAN HABITAT (ACRES) TOTAL	RIPARIAN HABITAT (ACRES) COMPLETED
Oregon				
Willamette	475	145	64,166	10,200
Columbia	821	65	136,254	80,720
Snake	160	52	2,060	905
Washington	106	1	469	303
TOTAL	1,562	263	202,949	92,128
Idaho				
Snake	1,279	420	15,785	792
GRAND TOTAL	2,841	683	218,734	92,920

Stream and riparian inventories and evaluation.

Table Twenty-Two

STATE/BASIN	# OF EVALUATIONS
Oregon/Washington	
Willamette	19
Columbia	39
Snake	4
TOTAL	62
Idaho	
Snake	62
GRAND TOTAL	124

Subbasin monitoring/analysis (includes research studies).

PROJECT MONITORING

Table 22 lists the number of studies needed to adequately monitor general habitat conditions of completed watershed plans. In addition, long-term costs for effectiveness and validation monitoring of representative watersheds are included. Long-term monitoring of representative watersheds is the best and least costly method of assessing whether standards and objectives are being met. A well conceived long-term monitoring study on entire watersheds will provide the same type of information produced by most research studies. Techniques used in monitoring will include GIS, remote sensing, seasonal fish population monitoring in cooperation with state fish and wildlife departments, infrared photography, aerial videography, and stream and riparian habitat inventories.

KEY WATERSHEDS

Key watersheds, *Table 23*, are those streams or rivers identified in FEMAT and PACFISH that (1) contain habitat for potentially threatened species or stocks of anadromous salmonids or other potentially threatened fish; or (2) have high quality water and intact habitat; or (3) have high restoration potential; or (4) contain a high percentage of federal land and have one or more of items 1-3. Of the 34 key watersheds listed in *Table 23*, four are key areas identified in FEMAT (1993) report, and 26 are key areas identified as priority watersheds for PACFISH. Included within BLM key areas are fall and spring/summer chinook salmon, coho salmon, coastal cutthroat trout, and summer and winter steelhead stocks that are determined to be at risk or of special concern.

WATERSHED RESTORATION

Habitat improvement projects are needed to increase productivity and expand habitat in watersheds throughout the Willamette, Snake, and Columbia River Basins. However, proper management strategies should be in place to meet watershed goals and objectives prior to scheduling habitat restoration work. Channel restoration work

Table Twenty-Three

DISTRICT/WATERSHED	STREAM	WATERSHED PRIORITY USFS[a]	AFS[b]	FEMAT[c]	BLM[d]	STOCKS AT RISK[e]	ISSUE[f]
Salem/Santiam	Little N. Santiam R.	W		X	2	2,5	2
Salem/Clackamas	Eagle Creek	H		X	1	4,5	2,3
Salem/Sandy	Salmon River	H		X	1	1,2,4,7	2,3
Eugene/Mckenzie	Bear/Marten Creeks	W		X	2	2	2
Prineville/Deschutes	Deschutes River	D	X		2	1,2,6,8	2,3
Prineville/John Day	Bridge Creek	O			1	6,8	2,3
Prineville/John Day	NF John Day River	U	X		2	1,2,6,8	2,3
Prineville/John Day	MF John Day River	M,O	X		2	1,2,6,8	2,3
Prineville/John Day	SF John Day River	M	X		1	6,8	2,3
Coeur d'Alene/SF Clearwater	American River	NP			1	1,2,6	2,3
Coeur d'Alene/SF Clearwater	Big Elk Creek	NP			2	1,2,6	2,3
Coeur d'Alene/SF Clearwater	SF Clearwater River	NP			2	1,2,6	2,3
Coeur d'Alene/ Lower Salmon	John Day Creek	NP			2	2,6	2,3
Coeur d'Alene/ Lower Salmon	Slate Creek	NP			2	2,6	2,3
Coeur d'Alene/ Lower Salmon	White Bird Creek	NP			2	2,6	2,3
Coeur d'Alene/ Lower Salmon	Deer Creek				2	6	2,3
Coeur d'Alene/ Lower Salmon	Eagle Creek				2	6	2,3
Coeur d'Alene/ Lower Salmon	China Creek				2	6	2,3
Coeur d'Alene/ Lower Salmon	Captain John Creek				2	2,6	2,3
Coeur d'Alene/ Lower Salmon	French Creek	P			2	2,6	2,3
Coeur d'Alene/ Lower Salmon	Partridge Creek	P			2	2,6	2,3
Coeur d'Alene/ Lower Salmon	Rapid River	P			2	2,6	2,3
Coeur d'Alene/ Lower Salmon	Boulder Creek	P			2	2,6	2,3
Coeur d'Alene/ Lower Salmon	Hazard/Hard Creeks	P			1	2,6	2,3
Coeur d'Alene/ Lemhi	Hayden Creek	S			1	2,6	2,3
Coeur d'Alene/ Lemhi	Upper Lemhi River	S			1	2,6	1,2
Coeur d'Alene/ Upper Salmon	Cow Creek	S			2	2,6	1,2
Coeur d'Alene/ Upper Salmon	Hat Creek	S			2	2,6	1,2
Coeur d'Alene/ Upper Salmon	Herd Creek	C			1	2,6	1,2,3
Coeur d'Alene/ Upper Salmon	Upper EF Salmon River	ST			1	2,6	1,2
Coeur d'Alene/ Pahsimeroi	Big Creek	S			2	2,6	1,2
Coeur d'Alene/ Pahsimeroi	Patterson Creek	S			2	2,6	1,2
Coeur d'Alene/ Pahsimeroi	WF Morgan Creek	C			2	2,6	1,2

a- USFS key watersheds, W=Willamette, H=Hood, O=Ochoco, D=Deschutes, U=Umatilla, NP=Nez Perce, C=Challis, S=Salmon, P=Payette, ST=Sawtooth. b- AFS (Oregon Chapter) list of candidate watersheds for reserves and restoration. c- Tier 1 key watersheds identified in FEMAT, 1993. d- 1= highest priority, 2= lower priority, restoration watershed. e- 1=Fall chinook salmon, 2=Spring/summer chinook salmon, 3= Chum salmon, 4= Coho salmon, 5=Winter steelhead, 6= Summer steelhead, 7=Coastal cutthroat, 8= Pacific lamprey. f- 1=intact, 2=high value, 3=restorable.

Key watersheds.

would only be conducted after inventories identified factors limiting fish production and watershed plans were completed and it was determined that improvements would be, in fact, beneficial to the survival and restoration of salmonids.

The completion of the anadromous fish improvements outlined in *Table 24* would improve habitat conditions on 952 miles of stream, 41,843 acres of riparian habitat, and 862,288 acres of uplands and roads on BLM lands in 52 subbasins in the Willamette, Snake, and Columbia River Basins. Also, 83 fish passage projects (culverts and irrigation diversions) and 14 screens would be constructed. All of the projects outlined would contribute to recovery goals of the Salmon Summit and Council. Watershed projects would increase wild fish numbers, thereby increasing wild genetic pools, increasing social values (e.g., "fish watching" and ceremonial subsistence fishing for Native Americans), meeting legislative requirements for multiple-use, increasing commercial and sport fishing, offsetting fish losses from hydropower dams and irrigation projects, and improving water quality and quantity. In conjunction with restoration projects, annual maintenance of instream structures, riparian rehabilitation, fences, road stabilization, fish passage, screens, and upland rehabilitation will be accomplished to maintain project and cost effectiveness of completed work.

Table Twenty-Four

STATE/BASIN	CHANNEL (MILES)	RIPARIAN (ACRES)	FISH PASSAGE	SCREENS(#)	WATERSHED
Oregon/Washington					
Willamette	139	13,275	8		370
Columbia	516	23,527			124,018
Snake	70	906			2,400
TOTAL	725	37,708	8		126,788
Idaho					
Snake	227	4,135	75	14	735,500
GRAND TOTAL	952	41,843	83	14	862,288

Watershed restoration opportunities.

Table Twenty-Five

STATE/BASIN	HABITAT ACQUIRED MILES	ACRES
Oregon/Washington		
Willamette	27	9,600
Columbia	84	38,720
Snake	23	14,000
TOTAL	134	62,320
Idaho		
Snake	101	30,515
GRAND TOTAL	235	92,835

Potential land tenure adjustments.

Land Tenure Adjustments

Because of the fragmented pattern of BLM lands within a watershed, management to benefit salmonids is extremely difficult without securing additional stream and riparian habitat to block up ownership. The BLM's opportunities to acquire habitat through easement, exchange, and purchase are listed in *Table 25*. Securing 235 miles of stream and 92,835 acres of riparian habitat and associated uplands in these basins would block up important anadromous fish habitats and lead to improved land manage-

ment and allow better habitat restoration throughout a watershed. Securing land will mostly be accomplished through land exchanges, maintaining compliance with BLM's policy of "no net gain" in total area.

Summary

BLM can play a significant role in restoring anadromous salmonid habitat in the Pacific Northwest, especially in the some of the watersheds in the Willamette, Columbia, and Snake River Basins. Over the past 20 years, BLM personnel have gained experience and expertise to implement sound management practices and complete watershed and habitat improvement projects for the benefit of anadromous fish. Originally, total costs of all management actions, projects, support and land acquisition described in this plan were estimated to be about $174.6 million from FY1993 to FY2000, however, in FY1994 and FY1995, BLM only received $19.4 million of the $36.45 million needed. Starting in FY 1996, to make up for unfunded priorities for inventory, monitoring, watershed plan development and restoration, $104.5 million is needed through FY 2000.

Full implementation of this plan could dramatically improve habitat conditions for anadromous fish on BLM land in the Willamette, Columbia, and Snake River Basins. Restoring habitat will eventually increase the productive capability for anadromous salmonids on BLM land, and if other problems were solved, more fish would be available to recreational, commercial, and tribal fishing, boosting the economies of individuals and local communities, and adding other social and scientific values.

Alaska

ANADROMOUS SALMONID HABITAT MANAGEMENT INITIATIVE FOR ALASKA RIVER BASINS

EDITED BY

Dennis Tol, Senior Technical Specialist Fisheries, BLM, Alaska State Office

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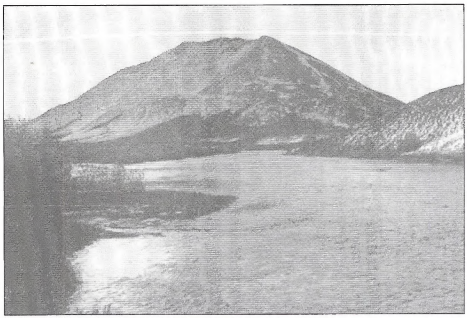
FEBRUARY 1996

Introduction

The issue of allocation and maintenance of anadromous fisheries resources in the Pacific Northwest and Alaska is significant. BLM's approach to watershed management and protection in the Pacific Northwest has been the implementation of FEMAT and interim PACFISH. These strategies will accomplish the national goals of management, maintenance, and restoration of anadromous fisheries on public lands. In Alaska, however, the policy requirements of PACFISH, such as riparian management objectives and widths, is not being implemented by BLM. The spirit of PACFISH, watershed management and maintenance of habitat production capabilities through a collaborative, integrated and interdisciplinary approach, will be used by BLM in Alaska to accomplish the national goals for anadromous fisheries. We are currently an active partner with state and federal agencies and industry in efforts to: design a statewide approach to watershed management; develop and establish methods, standards, and criteria for aquatic resource restoration and mitigation; and develop and integrate information management standards and data sharing capabilities across the state.



Alaska has 77% of streams supporting anadromous fish that BLM manages. The Pilgrim River on the Seward Peninsula supports chinook, coho, chum and pink salmon, as well as Dolly Vardon and whitefish.

Alaska accounts for 88% of the fishable stream miles, 90% of the lake habitat and 77% of the stream miles supporting anadromous fish that BLM manages. Presently, except for adults needed for spawning, salmon in Alaska are fully allocated for commercial, subsistence and recreational harvest. There are no salmon surpluses. Increased demands for salmon must be met through reallocation or artificially increased production. The following current trends relate to anadromous fisheries issues on public lands.

BLM will increase recreational fishing opportunity and pressure by developing new or expanding access to high quality, and sometimes sensitive fishing areas, such as Beaver Creek in the White Mountains area and the Gulkana River.

BLM expects increased management responsibilities for subsistence uses of fish, along with the need for information about habitat production capabilities and harvest levels.

A national and international movement toward protection and management of wild stocks of anadromous fish will create additional demands for information on the production capabilities of some public land streams, especially in the Yukon River watershed.

■ Expanding issues in other areas and declining budgets will reduce the capability of state agencies such as the Alaska Department of Fish and Game (ADFG) to operate on public lands in support of BLM management actions.

■ Currently, assessments to obtain water rights for instream flow has been limited to some congressionally designated streams and more assessment work is needed.

■ Demand for recreation, subsistence, and commercial harvest of fisheries resources produced on public land is increasing. Expanding development has increased NEPA requirements, reducing BLM's capability to respond to issues affecting fisheries management and habitat.

In general, information on anadromous fish distribution, stock identification, species occurrence, preferred habitat, crucial habitats, habitat availability, and habitat conditions and trend in Alaska is limited or not available.

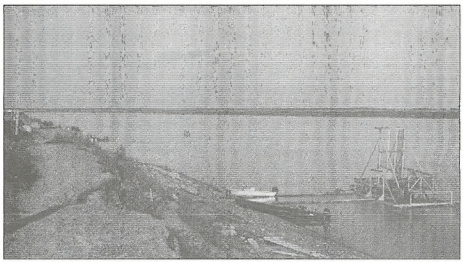
Resource Values

HABITAT

Stream habitats in Alaska vary from large river systems, such as the Gulkana and Unalakleet rivers, that provide year round habitat for most anadromous fish species, to small upper watershed tributaries like Hoosier Creek, that may be used seasonally by one or two species.

Alaska's climate complicates fisheries management. Arctic freshwaters are not as productive as those in temperate regions. Many of Alaska's aquatic systems only provide seasonal habitat for rearing fish because the long cold winters completely freeze river and lake systems requiring species to migrate great distances to over-winter. Available ice-free winter habitat is a crucial limiting factor, especially in stream systems. Fish species exhibit slower growth rates, longer life spans and sexual maturity at a later age.

Sixty-nine Aquatic Habitat Management Areas (AHMAs) have been identified in BLM watersheds. These contain 96,424 miles of fishable streams and 2.6 million surface acres of lake habitat. Of these, more than 43,078 miles of stream and 58.6 million watershed acres in 53 AHMAs support anadromous fish *(Table 26 and Figure 6)*. *Table 27* shows the estimated total BLM stream miles and anadromous stream miles and salmonid stock for each AHMA. More than 15,145 miles of stream on BLM administered land contain spawning and rearing populations of anadromous fish. Seven AHMAs have 1,000 miles or more of BLM administered anadromous salmonid streams, with the West Nulato Hills AHMA containing the most, 2,500 miles. Of the estimated total miles of stream used by anadromous fish for spawning and rearing, only 4,257



Subsistence fisheries, such as this fish wheel at Galena on the Yukon River, represent a major harvest of fish produced on BLM lands in Alaska.

miles have actually been documented as anadromous production habitat, but anadromous stream mileage will undoubtedly increase with additional baseline inventories.

Aquatic systems in Alaska provide a wide range of habitats, and most systems are assumed to be at or near their potential condition. Exceptions include the river systems within AHMAs listed in Table 28. These river systems continue to be impacted by gold and gravel mining activities.

ANADROMOUS SPECIES

In Alaska, BLM streams contain six species of anadromous salmon and trout (chum, chinook, coho, pink and sockeye salmon and steelhead). Also Dolly Vardon and members of the whitefish family (least and Arctic ciscos, broad and humpback whitefish, and sheefish) are anadromous and occupy public waters. Chum salmon followed by chinook salmon are the most common and found in the majority of the 53 salmon producing AHMAs (*Table 27*). In 37 AHMAs, 13,565 miles of stream directly support chum salmon, while 12,169 miles of stream in 37 AHMAs support chinook salmon. Most AHMAs contain numerous anadromous species, with the combination of chinook, coho, chum, and pink salmon, Dolly Vardon, and whitefish the most prevalent, occurring in seven AHMAs totaling 6,031 miles of anadromous streams. The amount and percentage of BLM administered anadromous stream miles varies greatly between AHMAs. For example, all 6,300 miles of stream in the Bendeleben/ Darby, West Nulato Hills, and Squirrel AHMAs are anadromous, containing at least populations of Dolly Vardon. However, in the Bonanza Creek AHMA, only eight miles (1%) of the 944 miles of stream supporting fish, are occupied by anadromous fish. Stocks are not often definable from each other in the lower portions of mixed stock watersheds. BLM-administered waters are often in the upper parts of the watersheds where stocks may be definable, and, where population dynamics may be measured.

Much of the anadromous fish distribution information, especially at the margins of the range, is anecdotal. Stock identification, population dynamics, and habitat use information is lacking throughout the state.

GIS

Table Twenty-Six

DISTRICT	# OF BASINS (AHMAs)	BLM STREAM MILES*	BLM ACRES (000s)
Northern District	31	25,286+	42,812
Glennallen	14	2,359	4,174
Anchorage	8	15,433	11,629
TOTAL	53	43,078+	58,615

* This information is based largely on estimates and accuracy will improve with GIS.

Anadromous salmonid habitat on BLM lands in Alaska.

Legislation

In addition to land management legislation, such as Federal Land Policy and Management Act of 1976 (FLPMA), ESA, the Mining Law of 1872, and the Sikes Act of 1960, public land in Alaska is also managed under a series of public laws that do not apply in the lower 48 states. These laws have a major impact on BLM management of land, fish, and wildlife.

Alaska National Interest Lands Conservation Act (ANILCA) of December 1980 (P.L. 96- 487) (16 U.S.C. 3101) (94 Stat. 2371).

This public law is among the most significant federal conservation measures ever enacted for Alaska. ANILCA added 104 million acres of "conservation system units" (CSUs)

Table Twenty-Seven

DISTRICT/AHMA	STREAM MILES TOTAL BLM	BLM ANAD.	ANAD. STOCKS[a]
Northern District			
Beaver Creek	1,500	110	Ch, Cu, S
Birch Creek	853	100	Ch, Cu, Sh
Fortymile	1,100	40	Ch, Cu, Sh
Black River	3,300	1,500	Cu, Sh
Lower Tanana	630	45	Ch, Cu
Ray River	724	33	Cu, Sh, Wh
Bonanza Creek	944	8	Cu
Jim River	574	47	Ch, Cu
S F Koyukuk River	809	70	Ch, Cu, Wh
M F Koyukuk River	1,404	89	Ch, Cu, Sh, Wh
Galbraith Lake	224	73	Dv
L Colville River	?	165	Ch, Pi, Dv
Utukok River	?	165	Ch, Pi, Dv
Kuk River	?	13	Ch, Pi
Meade River	?	103	Cu, Wh
Ikpikpuk River	?	615	Pi, Wh
Teshekpuk Lake	?	104	Cu, Pi, Dv, Wh
U Colville River	?	252	Cu, Pi, Dv, Wh
Cama	?	379	Cu, Pi, Dv, Wh
Bendeleben/Darby	2,000	2,000	Ch, Co, Cu, Pi, Dv, Wh
W. Nulato Hills	2,500	2,500	Ch, Co, Cu, Pi, Dv, Wh
Squirrel	1,800	1,800	Ch, Cu, Pi, Dv, Wh
Solomon	15	15	Ch, Co, Cu, Pi, Dv, Wh
Hogatza	800	75	Ch, Cu, Wh
Indian	294	50	Ch, Cu
Buckland	500	200	Cu
E. Nulato Hills	1,500	500	Ch, Cu, Wh
Tozitna	1,000	1,000	Ch, Cu
Manley/Rampart	15	8	Ch, Cu
Imuruk Basin	2,000	1,000	Ch, Co, Cu, Pi, Dv, Wh
Kigluaik Mountains	800	500	Ch, Co, Cu, Pi, Dv, Wh
DISTRICT TOTAL	**25,286+13,559		

DISTRICT/AHMA	STREAM MILES TOTAL BLM	BLM ANAD.	ANAD. STOCKS[a]
Glennallen District			
Nenana	786	54	Ch, So
Lower Susitna	780	22	Co, Cu
M F Gulkana	108	62	Ch, So, St
E F Gulkana	26	26	So
U. Copper River	56	56	Ch, So
Bering Glacier	22	22	Co
Soloman	12	12	Cu, Pi,
Tonsina	180	74	Ch, Co, So
Chitina	88	40	Co, So
Shoup	16	12	Co, Cu, Pi, Dv
L. Gulkana	7	7	Ch, So, St
Gakona River	18	18	Ch
U. Gulkana	48	48	Ch, So, St
WF Gulkana	212	142	Ch, So
DISTRICT TOTAL	2,359	595	
Anchorage District			
Sleetmute	1,203	113	Ch, Co, Cu, Pi, Sh, Wh
Unalakleet	2,761	236	Ch, Co, Cu, Pi, Dv
Holy Cross	3,585	147	Ch, Co, Cu
Goodnews	805	16	Ch, Co, Cu, Pi, Dv, Wh
Russian Mission	2,165	23	Ch, Co, Cu, Sh, Wh
Lime Hills	1,354	18	Ch, Co, Cu, Pi
McGrath	1,241	231	Ch, Co, Cu, Sh
Anvik	2,319	207	Ch, Co, Cu, Pi
DISTRICT TOTAL	15,433	991	
TOTAL	**43,078+15,145		

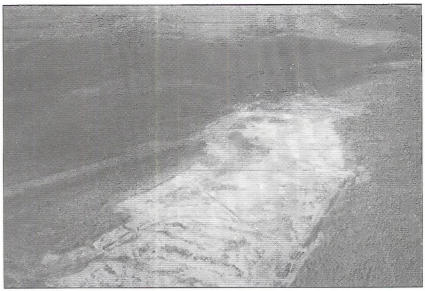
a-Ch=chinook salmon; Co=coho salmon; Cu=chum salmon; Pi=pink salmon;So=sockeye salmon; Dv=Dolly Vardon; Sh=sheefish; Wh=whitefish; St= steelhead. ** No public stream mileage calculations or estimates for eight AHMA's. All contain highly complex stream and lake systems, with a possible additional 30,000 to 50,000 miles of public stream.

Aquatic Habitat Management Areas, BLM anadromous stream miles, and anadromous salmonid stocks in Alaska.

in Alaska. ANILCA established or expanded a number of national parks, wildlife refuges, wild and scenic rivers, wildernesses, national forests, monuments, conservation areas, recreation areas, and wilderness study areas. This doubled the size of the National Park and National Wildlife Refuge systems, and tripled the size of the National Wilderness Preservation System. ANILCA requires the federal government to provide a rural preference for subsistence taking of fish and wildlife over other consumptive uses of fish and wildlife on federal land in Alaska.

Alaska Native Claims Settlement Act (ANCSA) of December 1971 (P.L. 92-203) (43 U.S.C. 1601) (85 Stat. 688).

ANCSA resolves claims by Natives and Native groups of Alaska, based on aboriginal land claims. Thirteen Native regional corporations and more than 200 village corporations were established. ANCSA entitled those corporations to $962.5 million dollars and authorized BLM to survey and convey 45 million acres of land to the village and regional corporations. Village corporations were entitled to the surface estates and regional corporations the subsurface estate. Acreage entitlements were based on enrollment of Natives in each corporation. ANCSA also established a precedence for Native land claims over state land claims. Also, the Act impacted BLM fisheries management responsibilities by increasing coordination requirements for fishery projects planned in areas that contain selected parcels of land. BLM now must get tacit approval and a letter of non-objection from the affected Native corporation.



Placer mining has the biggest negative impact on Alaska's stream systems, presently about 319 of stream have been impacted through channel modification on BLM administered lands.

Alaska Statehood Act of July 1958 (P.L. 85-508) (72 Stat. 339).

The Alaska Statehood Act (as amended by ANILCA) authorized the State of Alaska to select about 105 million acres of federal land. The Act instructs BLM to systematically survey and convey these lands based on the state's priority selection process. A deadline of January 1994 for the state to file final selection (25-year selection period) was established. The Act instructed the state to select "reasonably compact tracts," which was later interpreted as minimum 5,760-acre parcels (one-quarter township) to facilitate survey. The Submerged Lands Act of 1953 was incorporated into the Alaska Statehood Act by reference and confirms that by federal common law, submerged lands beneath navigable waters pass to the states upon their admission to the Union.

LAND TENURE

The original mission of BLM in Alaska was to function as caretaker and land conveyer. Of the original 323 million acres of land, BLM will be responsible for 70 million acres remaining after conveyance. The agency's mission is changing as lands that BLM ultimately will be responsible for are identified. BLM continues to convey lands, but is assuming a greater land management role.

BLM Alaska Land Management History

Original Management Responsibility	323 million acres
Alaska Statehood Act Removed	105 million acres
Alaska Native Claims Settlement Act Removed	44 million acres
Congressional Reservations Removed	104 million acres
Remaining Under BLM Management After Conveyance	70 million acres
Currently Responsible for	88 million acres

Issues

As stated in the Executive Summary, BLM's management goal for anadromous fisheries is to conserve and restore anadromous stocks. In Alaska, land use, development, and harvest are broad issues influencing the attainment of this goal.

RESOURCE EXTRACTION

Resource extraction activities altering anadromous fish habitat include mineral exploration and extraction for oil, sand and gravel, gold and other minerals. Placer mining is the single greastest threat to fisheries, riparian and stream ecosystems in Alaska (especially in Arctic systems where permafrost and ice build-ups may be a factor). Impacts from placer mining include direct soil disturbance in valley bottoms and stream channels during gold and gravel mining, indirect downstream impacts on water quality from erosion at mining sites, and stream channel and watershed disturbance from roads constructed to access mining equipment and maintain operations. Currently, 7.5% of the documented anadromous fish production habitat in Alaska (319 of 4,257 miles) is directly impacted by mining and mining related activities *(Table 28)*. Eight of the 55 AHMAs have 10 or more miles of anadromous stream directly impacted from mining activities. Birch Creek, Fortymile and Manley/Rampart AHMAs have from 17 to 100% of their anadromous streams impacted from mining. However, much more habitat has been impacted from deteriorated water quality and increased sedimentation downstream from onsite mining operations.

ROAD AND UTILITY DEVELOPMENT

Aquatic and riparian ecosystems in Alaska are being modified by the development of transportation, access and utility corridors. Construction activities impact fish and aquatic habitat by: restricting fish movement from improperly placed culverts; increasing sediment and turbidity as a result of poorly reclaimed construction sites; and reduced water availability from withdrawals for road construction and maintenance.

WILD AND SCENIC RIVERS AND WATER RIGHTS

BLM is currently required, either by legislation or court order, to study, inventory and assess water rights on wild and scenic rivers. Also, BLM is pursuing instream flow reservations for salmon spawning on some streams threatened by development.

WILD STOCK MANAGEMENT

Long-term and broad-based research generally indicates that enhancing wild stocks through hatchery stocking may accelerate the decline of wild stocks. As stocking of hatchery fish is reduced, management adjustments will be needed to ensure that harvest does not exceed the habitat production capabilities of anadromous fish. Some of Alaska's native anadromous stocks could be jeopardized with continued hatchery stocking.

RECREATION

Concentrated recreation is beginning to negatively impact fisheries through harvest and habitat modification, especially in those systems that are readily accessible by road. However, fishing opportunities with public access are limited in Alaska and the construction of campgrounds and boat launches in streamside areas serves to concentrate use. Most of the outstanding recreational fishing opportunities are remote, accessed only through guided trips and float planes. The cost of this activity is prohibitive for most people.

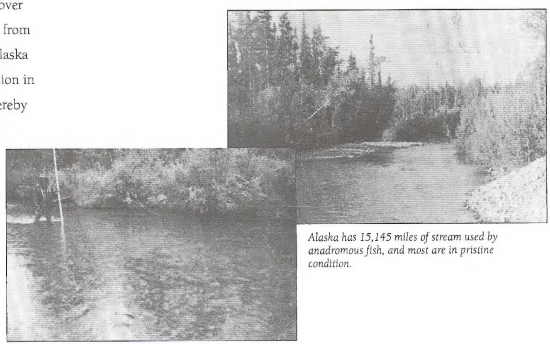
HARVEST

Over harvest by sport, commercial and subsistence fishing has reduced salmon and trout populations in some areas. For example, over harvest of sockeye salmon from Salmon Lake in western Alaska caused a continued reduction in spawning populations, thereby reducing salmon carcasses and the resulting major nutrient source. Some sensitive lakes and streams, once only lightly used, are now being subjected to increased harvest. Increased demand on Alaska's fishery resources means increased responsibility on BLM to understand, protect and monitor these resources and make appropriate recommendations to ADFG.

SUBSISTENCE FISHERIES

In December of 1989, the Alaska Supreme Court found the State subsistence law was unconstitutional, thereby placing the State out of compliance with Federal law (ANILCA, Title VIII). As of July 1990, the Department of Interior (DOI) and USFS assumed jurisdiction of subsistence harvests on public lands. A policy was adopted that limited jurisdiction to federal public lands not validly selected by the State or Native corporations, non-navigable waters on such lands, and navigable waters only in pre-Statehood withdrawals ("public lands" per Section 102 ANILCA). This limited Federal jurisdiction over fisheries management, because little subsistence fishing occurs in these waters.

Litigation (*Katie John et al vs. U.S.*) was filed in District Court on December 5, 1990, to extend jurisdiction of Federal subsistence management into all navigable waters in the State. On July 15, 1993, Native American Rights Fund (NARF) and others submitted a petition for rule making to the Secretaries of Agriculture and Interior so that all navigable waters and Federal reserved waters are "public lands" subject to subsistence priority imposed by Title VIII of ANILCA. Such rule making would allow the Federal government to



Alaska has 15,145 miles of stream used by anadromous fish, and most are in pristine condition.

About 4,257 miles of BLM administered streams in Alaska have been documented as anadromous production habitat.

Chum Salmon

(Oncorhynchus keta)

DISTRIBUTION

Mackenzie River, Northwest Territories to San Lorenzo River, California

STOCKS

California - 2 (both extinct); *Oregon* - 26 (15 at high risk); *Washington* - 27 (six at high risk); *Alaska* - 65 (Yukon River Basin).

WILD ADULT STATUS

1930s - averaged 130,000 fish in Tillamook Bay, Oregon
1980s - averaged 21,000 fish in Tillamook Bay, Oregon

LIFE HISTORY

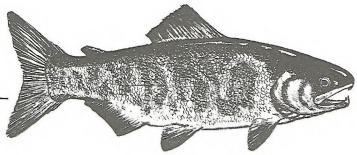
- generally, most fish have a three to four year life cycle
- adults generally return to their natal stream and always die after spawning
- adults spawn in November to early December, usually only a short distance about tidewater (except Alaska)
- second only to chinook salmon in size, reaching a length of 43" and a weight of 46 pounds
- females lay between 2,400 to 3,000 eggs in the gravel
- young migrate downstream 2-4 months after eggs are laid in gravel

HABITAT REQUIREMENTS

- need clean 1-6" gravel located low in mainstem rivers and main tributaries
- generally spawn below first barrier in mainstem rivers since they are not good jumpers, also spawn larger tributary streams and beach areas
- need productive estuaries for feeding during early life stages

IT'S A FACT

Chum salmon are called *Dog Salmon* because they were the main part of Eskimo sled dogs' diet.



manage subsistence fisheries throughout the State, including the territorial seas (out to 3 miles offshore). Moreover, on April 12, 1994, the Northwest Arctic Regional Council (NARC) and others submitted a petition for rule making to, among other things, require Federal authorities to extend jurisdiction beyond the boundaries of public lands where necessary to regulate hunting and fishing on non-public lands to protect the subsistence priority.

On March 30, 1994, the District Court of Alaska issued a decision in *Katie John et al. v. U.S.* that all navigable waters in the State of Alaska are "public lands" for purposes of administering subsistence fisheries management pursuant to Title VIII of ANILCA. This decision was immediately stayed pending review by the Ninth Circuit Court of Appeals. On April 20, 1995, the Ninth Circuit reversed the District Court's decision and found that only those waters in which the United States has reserved water rights fall within the Federal jurisdiction for the purposes of Title VIII of ANILCA. The State of Alaska has petitioned the Supreme Court to review the decision. If the Supreme Court refuses to hear the case, the Ninth Circuit's decision will prevail and the District Court will implement the decision.

If the Ninth Circuit's decision stands, the DOI agencies and the USFS, will probably be required to develop and implement a program for managing fisheries in waters where the U.S. has reserved water rights. These waters include both navigable and non-navigable waters in conservation system units such as national forests, national wildlife refuges, national parks, monuments and preserves, national recreation areas, national conservation areas and wild and scenic rivers. However, implementation of such a program may also require that jurisdiction be extended beyond federal reserved waters in cases where land use activities are affecting subsistence fishing on public lands (as requested by the NARC petition). This would necessarily require the management or joint management (State/Federal) of both commercial and sport fisheries across the state. The implications of such an effort are formidable and would require more funding and staffing for all the involved agencies, including BLM.

BLM's future role in Alaksa's fisheries management is uncertain. Logically, fisheries management in Alaska should adopt an ecosystem management approach instead of fragmenting management based on land status. The current Federal Subsistence Board, made up of regional, state and area directors, will likely maintain decision making authority over fishing regulations.

Table Twenty-Eight

DISTRICT/AHMA	MILES IMPACTED	ACTIVITY
Northern District		
Beaver	58	Mining
Preacher	17	Mining
Birch	149	Mining
Fortymile	34	Mining
MF Koyukuk	10	Mining, roads
Jim	3	Mining, roads
Squirrel	6	Mining
Imuruk Basin	10	Mining
Solomon	4	Mining
Manley/Rampart	8	Mining
Nowitna	2	Mining
Glennallen District		
U. Sustina	2	Mining
Lower Gulkana	1	Oil and gas
Anchorage District		
Sleetmute	15	Mining
TOTAL	319	

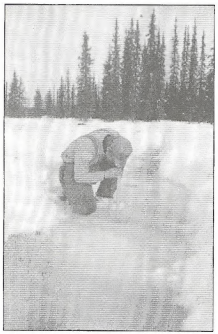
Miles of stream directly impacted by land disturbance activities (direct impacts equate to actual soil disturbance).

YUKON RIVER SALMON TREATY

A treaty between Canada and the United States is being negotiated to resolve issues about depleted salmon stocks that originate in the Canadian portion of the Yukon Basin and are heavily harvested by U. S. commercial and subsistence fishermen. Negotiations, which started in 1985, have produced changes in the treaty language that set management priority for protecting wild stocks.

Compensation for U. S. harvests of salmon spawned in Canada is

one important issue. An interim agreement has been implemented with Canada which establishes a Restoration and Enhancement Fund and authorizes annual funding for work in the Yukon Basin. Since BLM manages some land in the Yukon Basin, it could become involved in the long term, but Canadian stocks of salmon and harvest management are the emphasis of the treaty. BLM may become part of a basin-wide planning effort aimed at reducing pressure on Canadian stocks, and BLM could take part in regulating harvests of salmon through subsistence.



Alaska's cold winters freeze rivers and complicate fisheries management.

Current Management

Prior to the late 1980's, BLM's fisheries management program in Alaska was accomplished with limited funding and few biologists; consequently most data collection was general and directed at large-scale planning issues. Increasingly since 1988, efforts are directed toward collecting more detailed information in response to specific impacts on aquatic resources in watersheds. Emphasis is on multi-disciplinary teamwork, including: leveraging funds and people; assuming active roles in interagency and private work groups; and conducting watershed analysis to compensate for declining agency resources. This emphasis, along with issue-driven management will allow BLM to progress toward a goal of conserving and restoring wild anadromous salmonid stocks. Also, to accomplish this goal, additional information regarding baseline conditions, monitoring, restoration, habitat use and relationships, and stock genetics and identification studies are needed.

KEY (PRIORITY) WATERSHEDS

Watersheds with significant issues and aquatic resource values have been identified as AHMAs. The criteria used to identify AHMAs as key watersheds within the BLM's area of management responsibility are:

- Watersheds with high resource values
- Watersheds with land disturbing activities
- Watersheds with high consumptive demand
- Watersheds with Congressional or administrative designation
- Watersheds serving as baseline representation

AHMAs proposed as key watersheds are depicted on *Figure 7.*

MANAGEMENT PLANNING

Management plans specific to resource values have been completed at different levels of detail for some watersheds. These include the following specific plans completed since 1994: Indian River; Hogatza; and Beaver and Birch Creeks. The Norton Sound Aquatic Habitat Management Plan, completed in 1988, is much broader in scope and applies general objectives to a group of AHMAs on the Seward Peninsula. There are no comprehensive watershed assessments or watershed plans completed for any AHMA on a multidisciplinary basis for BLM Alaska. Alaska BLM has other documents that guide fisheries management, including five broad scale RMPs; one Management

Framework Plan (MFP); and numerous NEPA documents.

INVENTORY

Considering the vastness of aquatic and fishery resources in Alaska, relatively little detailed information has been gathered by state or federal personnel. Obtaining adequate baseline data would allow BLM Alaska to fulfill its obligation as a management partner when participating in landscape or ecosystem planning and management efforts. Baseline data are required to provide information to monitor success in managing for ecosystem sustainability. Baseline information will increase in importance as we determine BLM's obligations under subsistence fisheries management and the Yukon River Salmon Treaty with Canada and the results of basin wide planning. Our basic inventory approach is to supplement broad-scale information with detailed information where necessary. The inventory strategy for BLM Alaska includes two primary objectives:

- Develop an inventory and monitoring effort for anadromous habitats and other aquatic resources that is responsive to current issues and priorities, is cost effective and expedient, is consistent, is flexible and responsive to a variety of circumstances.
- Complete both low and high-detail aquatic resource inventories on priority habitats and watersheds, an aquatic resources data management system, and a digital hydrography component of BLM's Alaska GIS.

Broad scale information includes:

Digital hydrography
Digital elevation model data
Information derived from maps, records
Supplemental and historical information
Land cover

Detailed aquatic resources data includes:

Channel, habitat, and riparian image analysis from aerial photography and videography
Basin wide habitat inventory
Channel morphology
Escapement documentation
Spawning and rearing habitat documentation
Flow dynamics
Life history and population dynamics

Inventory information to document channel morphology, flow dynamics and the quantity, quality, and complexity of stream and riparian habitat is needed. Also, other information such as harvest levels, population dynamics, and life history and habitat requirements is needed to address management of subsistence, stock status, and NEPA compliance. Presently there are only 87 miles of baseline detailed stream habitat inventory in nine streams and in six different AHMAs that can be used to support decisions about impact analysis, restoration, and mitigation *(Table 29)*. Detailed stream inventories have been conducted in seven AHMAs, mostly in the Northern District, with Boston Creek in the Bendeleben/Darby AHMA having the most (28 miles) and highest percentage (65%)of stream inventoried. Another approximately 4,679 miles of stream have completed broad scale inventories.

DATA MANAGEMENT AND GIS

An interagency agreement between BLM and the U.S. Geological Survey (USGS) was established to share costs for photo revision of hydrography data and production of Digital Elevational Model data for BLM land in Alaska. The revised information will be made available to the public and other users through the National Digital Cartographic Database.

ARIMS was developed in Alaska to modernize the management of field generated aquatic resources information. The revised hydrography data in Digital Line Graphic

will be part of the aquatic resources data base and used in a geographic information system environment. Hydrography, or the digitized water layer from USGS maps, is a base layer of data that is of particular importance to management of ecosystems in Alaska. The data will be used by all levels of Alaska for mapping and analysis applications related to resource management. Some specific uses include navigability determinations; location, range and distribution of cultural and sensitive aquatic resources; relationship analysis of land use and resource values; land status and aquatic resource relationships; water right determinations; land conveyance; identification of riparian areas; and subsistence fisheries management.

MONITORING

Alaska BLM is applying initial stages of integrated and interdisciplinary approaches to watershed monitoring. Currently six projects are ongoing, directed mostly at evaluating the effectiveness of mitigation measures and reclamation standards on disturbed channels. Parameters measured include water quality and quantity, channel dynamics, fish population and distribution, and invertebrate community composition.

Restoration in Alaska BLM relates primarily to streams impacted by road construction and mineral development. In areas open to mineral development, restoration has not been a high priority because they can be continually subjected to disturbance. However, working cooperatively with the developers in areas open to mineral development can ensure the proper restoration techniques are used to restore habitat to a productive condition. For BLM lands, opportunities for restoration have been identified for eight streams: E.F. Solomon River; Nome Creek; Tisuk River; Feather River; Oregon Creek; Julian Creek;

Table Twenty-Nine

DISTRICT/AHMA	STREAM	TOTAL	STREAM MILES INVENTORIED
Northern District			
Birch	Fryingpan Creek	25.0	8.0
Jim	Jim River	86.0	13.0
Indian	Upper and Lower Indian River	89.0	2.5
Indian	Big Creek	25.4	0.3
Hogatza	Aloha Creek	15.2	7.0
Hogatza	Bear Creek	14.5	0.5
Hogatza	Clear Creek	24.1	12.5
Bendeleben/Darby	Boston Creek	43.0	28.0
Bendeleben/Darby	East Fork Solomon Creek	8.5	0.3
Manley Rampart	Hoosier Creek	11.0	0.3
Glennallen District			
M F Gulkana	Middle Fork Gulkana River	25.5	15.0
TOTAL		367.2	87.4

Detailed (basin-wide) stream habitat inventories and broad scale habitat inventories completed in Alaska as of 1995.

Hoosier Creek; and Chapman Creek. In total, 15 miles of stream and 537 acres of riparian habitat have been identified for restoration *(Table 5)*, with an estimated cost of $355,000. Nome Creek, a chinook salmon rearing stream in the upper Beaver Creek watershed, for example, is a proposed project that would restore 2.5 miles of placer mined stream channel and 60 acres of riparian habitat. This is a cooperative project with ADFG and Department of Transportation.

In western Alaska, BLM is also conducting restoration of streams subjected to over-harvest. A cooperative project with ADFG and Bering Sea Fisherman's Association is restoring sockeye salmon to historic levels in Salmon and Glacial lakes

The vastness and remoteness of Alaska's aquatic resources complicate logistics and increase costs of fisheries management.

Future Management

Analysis of Alaska BLM key watersheds *(Figure 7)* could take about 20 years at the current funding and staffing levels and declining budgets. Time frames could be shortened with prioritization and improved efficiency, including:

- establish an interdisci- team approach to managing resource problems,
- refocusing existing es toward the issue,
- sharing funds and budgets n programs concerned with aquatic resource impacts and management, and
- leveraging resources with s of common interests and responsibilities.

Inventory and monitoring of key watersheds could be accomplished through an outside contract or a project staff hired for the term of the project, or a combination of both. Because funding and personnel trends are likely to decrease in the next five to ten years, continuing existing base programs will be difficult. Any additional funding for inventory and monitoring aquatic resources will have to be dedicated as special project allocations. For example, the analysis of key watersheds in the next five years would require an annual addition of $1.4 million for Alaska BLM. These funds would be used to hire a temporary contract crew dedicated to the project. This would temporarily double the existing multi-disciplinary staff.

The foreseeable workload increases associated with subsistence management, large basin planning, collaborative aquatic habitat restoration efforts, and watershed assessment will constrain the ability of BLM to effectively manage resources. If BLM acquires responsibility for jurisdiction over subsistence fisheries management, staffing and funding requirements would have to be increased correspondingly.

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Appendix 1

Legislation and Policy

The following laws, treaties, MOUs, and cooperative agreements pertain to management of anadromous fish habitat on Bureau administered lands:

- Federal Land Policy and Management Act of 1976
- Endangered Species Act of 1973
- Sikes Act of 1960
- Alaska National Interest Lands Conservation Act of 1980
- Master MOUs between BLM and state fish and wildlife agencies
- Alaska Native Claims Act of 1971
- The O&C Act of 1937
- Alaska Statehood Act of 1958
- The Mitchell Act of 1938
- The Pacific Northwest Electric Power Planning and Conservation Act of 1980
- BLM Special Status Species Policy Manual 6840
- BLM Riparian Policy, 1987
- National Recreational Fisheries Policy, 1988
- Fish and Wildlife 2000 - A Plan for the Future, 1987
- BLM Anadromous Fish Habitat Management Strategic Plan, 1988
- MOUs with the academic community for development and processing of digital information
- FEMAT FSEIS and ROD and PACFISH EA and ROD
- MOA on Pacific Salmon Conservation, 1994
- Yukon River Salmon Treaty, being negotiated

Appendix 2

Annual funding needs by state for operational and restoration costs for anadromous fish.

STATE	OPERATIONAL COSTS (000s)	RESTORATION COSTS (000s)
Alaska	1,860	-
California	110	1,100
Idaho	3,000	6,600
Oregon	4,500	13,500
Washington	100	50
TOTAL	9,570	21,250

Appendix 3

Personnel needs — permanent fishery biologists (based on 1994 projections).

STATE	EXISTING	ADDITIONAL	TOTAL
Alaska	6	5	11
California	3	2	5
Idaho	7	3	10
Oregon	24	18	42
Washington	1	1	2
TOTAL	41	29	70

Appendix 3: Maps

Figure 1: Anadromous Streams of California

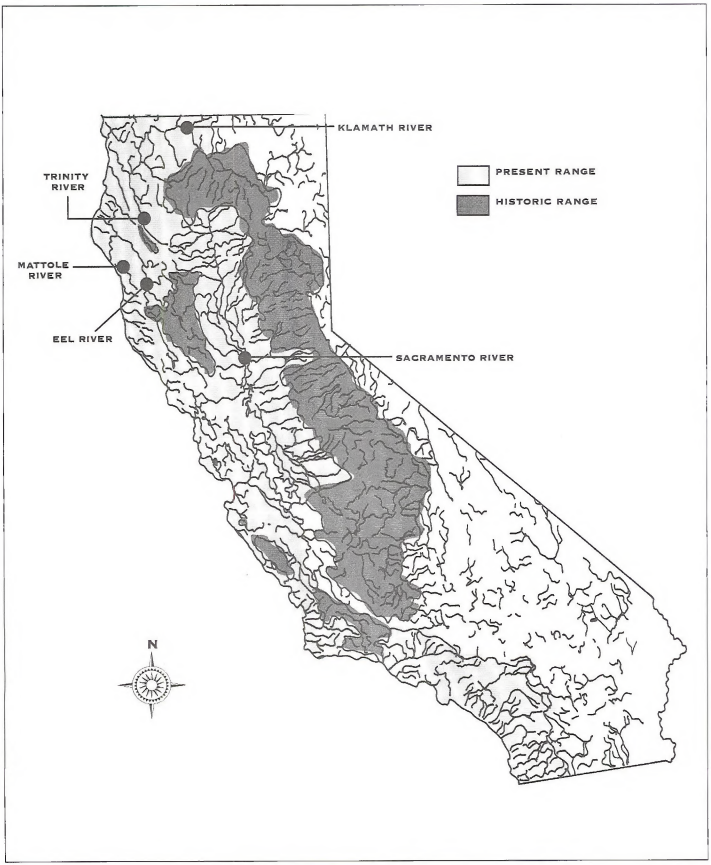


Figure 2: Anadromous Streams of Oregon

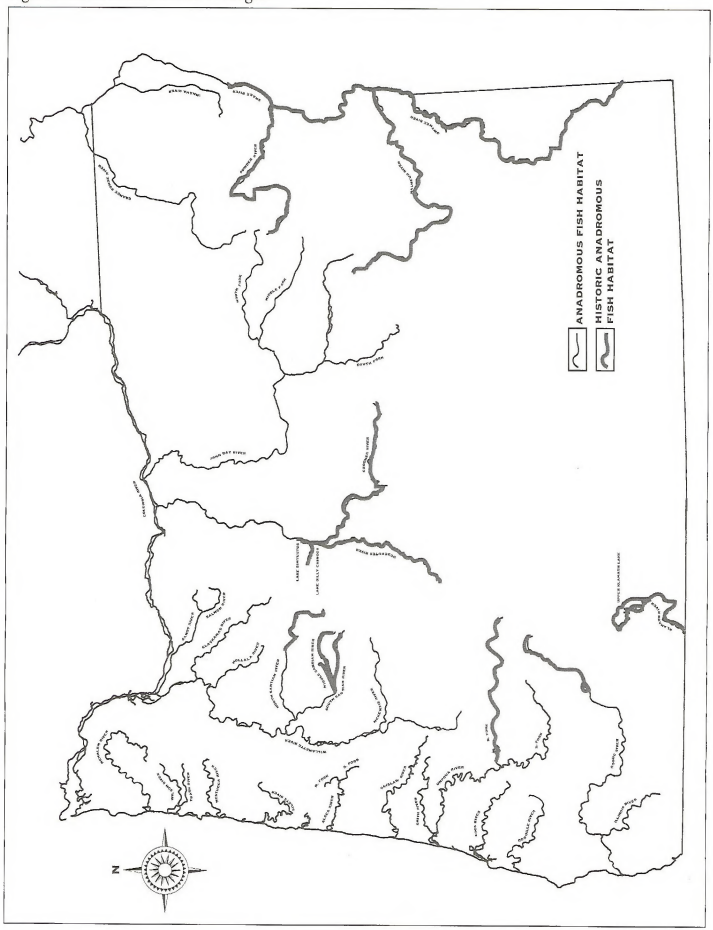
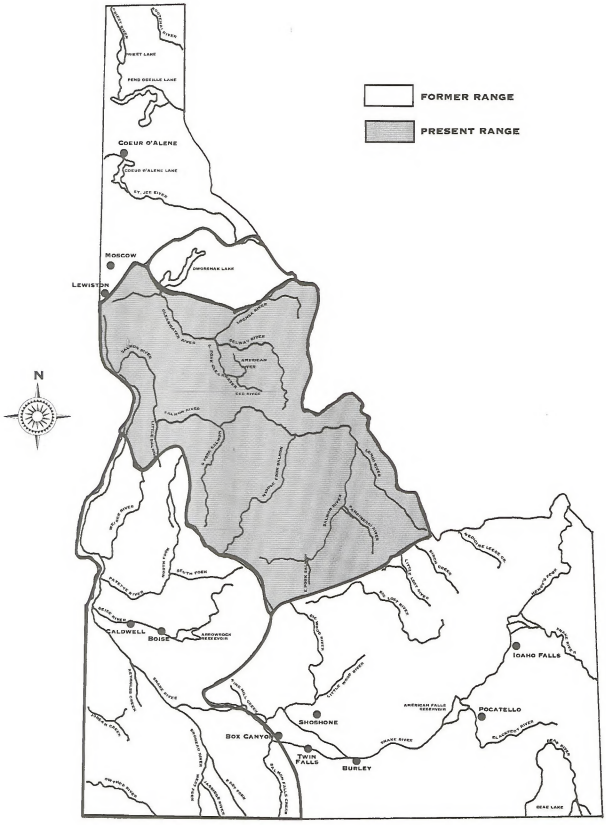


Figure 3: Anadromous Streams of Washington

Figure 4: Anadromous Streams of Idaho



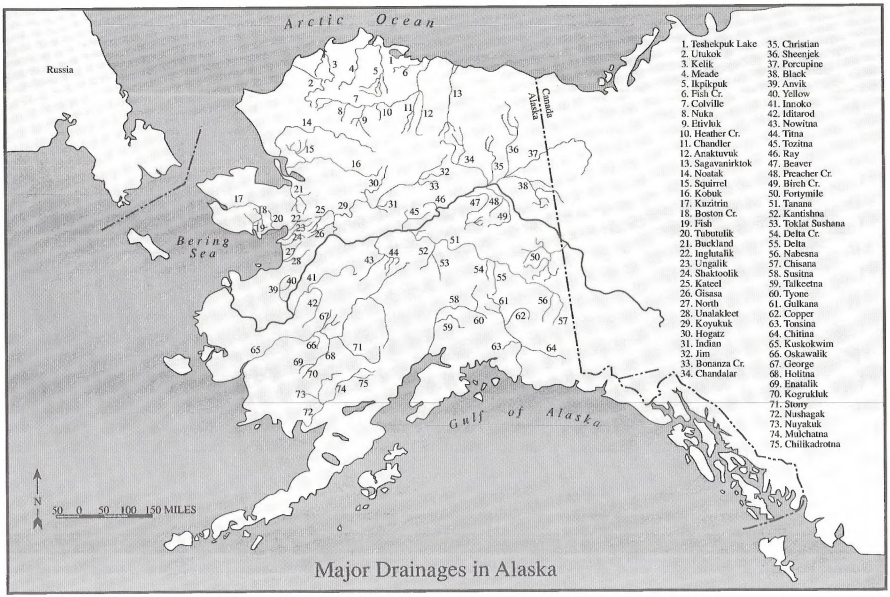


Figure 5. Anadromous Streams of Alaska

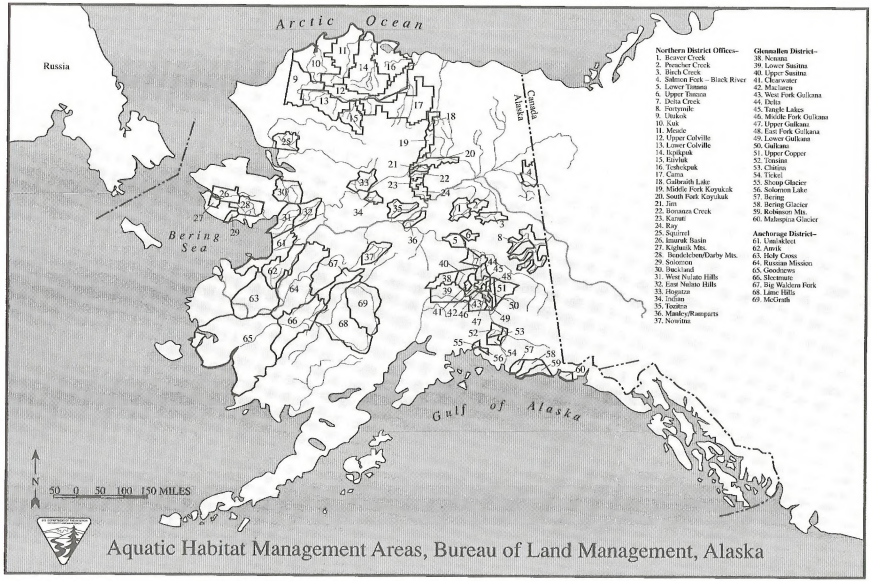


Figure 6: Aquatic Habitat Management Areas of Alaska

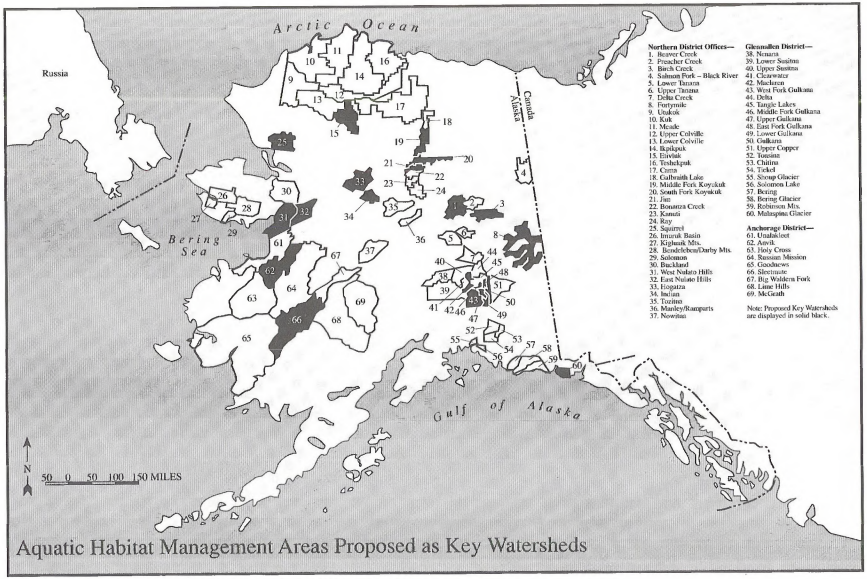


Figure 7. Key (Priority) Watersheds in Alaska

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"Management of Anadromous Fish Habitat on Public Lands" represents a watershed approach to managing public lands in Alaska, California, Idaho, Oregon, and Washington. The document summarizes the past management history and the amount and condition of riparian and aquatic components of watersheds containing anadromous fish for each state. The report, separated into three regions (coastal, Columbia and Alaska), outlines the critical components of successful management for these areas. Management actions, including establishing riparian reserves, conducting watershed analysis, and identifying key watersheds and watershed restoration activities, are needed to conserve and restore remaining wild stocks of anadromous salmonids.

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